RELEASE OF OLD AND NEW WATER FROM AN UNDISTURBED FOREST PEDON IN THE QUACHITA NATIONAL FOREST

By

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Figure | Page

GLOSSARY

new water	Water added to the soil which is characterized by a particular solute concentration.
old water	Water contained in the soil before the addition of new water. Characterized by a particular solute concentration different from new water.
pedon	A block of undisturbed soil left in place but isolated from the surrounding soil.

INTRODUCTION

The fate of chemicals in the forest environment is a matter of great concern. These chemicals include intentionally applied chemicals like pesticides, unintentionally applied chemicals such as those occurring in atmospheric deposition, naturally occurring compounds like plant nutrients, and dumped chemicals including hazardous wastes. Numerous studies have been conducted which examine the fate of chemicals in agricultural soils, especially soils of uniform texture and composition (Andreini and Steenhaus, 1990; Thomas and Phillips, 1979; Horton and Hawkins, 1965). Many of these studies investigated flow through micropores or matrix flow (Bodman and Coleman, 1943) and overland flow (Horton, 1933). Starting in the late 1960's, however, the emphasis switched to preferential flow, a concept presented by Lawes et al. (1882). Likewise, modern researchers also found preferential flow to be significant (Wilson et al, 1990; Germann and Bevin, 1982; Elrick and French, 1966; and Wild, 1972). Forest soils tend to be well structured, having a highly spatially variable network of interconnecting pores (Luxmoore, 1981; Luxmoore et al, 1990). Because of these conditions, the occurrence of preferential flow is quite important in runoff generation processes (Whipkey, 1969; Bevin and Germann, 1982; Megahan and Clayton, 1983). However, in spite of these studies, the source of this runoff is still unclear: is it new water or old water?

The implications of new water vs. old water flowing from the soil are important in the control of applied chemicals. If water contained in the soil, or old water, is the primary source of outflow, the chemicals have a greater opportunity for degradation, sorption, and uptake by plants. Conversely, if new water is the primary source of outflow, the chemical could be flushed quickly from the soil, possibly causing ground or surface water contamination problems. Using a chemical would also be less efficient, requiring more to achieve the desired effect which would add to the cost and probability of contamination.

The mechanisms of solute movement, especially those mechanisms concerned with old/new water relationships, must be understood. Most of our present models of solute transport are based on, to varying degrees, convection-dispersion equations and capillary flow. Many studies, however, have shown that these models underestimate the movement of chemicals because they fail to account for preferential flow (Kissel et al, 1973; Beven and Germann, 1982; Everts et al, 1989; Luxmoore et al, 1990).

Limited research has been conducted on the occurrence of old water vs. new water, but the mechanism is still unclear. In fact, one site in New Zealand was used for two separate studies (Mosley, 1979, 1982 and Pearce et al, 1986) that yielded contradicting results. Mosley concluded that new water was the dominant source of stormflow while Pearce et al found that the opposite was true, old water was dominant.

New water is thought to dominate runoff in two cases. The first case is when most of the flow results from saturation overland flow (Pilgrim et al, 1979; Pearce, 1990; Sklash, 1990). Saturation overland flow is significant in wide, flat, or concave valley bottoms with sufficient surface area to produce large enough volumes to dominate subsurface flow (Pearce, 1990).

The other case resulting in dominant new water concentrations is after intense rains (Luxmoore et al, 1990), especially in soils with strong structure like those found in forests (Thomas and Phillips, 1979). One possible explanation for this is that flow through preferential flow paths is rapid enough to reduce the occurrence of chemical exchange and the increased probability of saturation overland flow resulting from high intensity storms.

Old water has been found to be the dominant source of flow in many watersheds (Kennedy et al, 1986; Pearce et al, 1986). Luxmoore et al (1990) Kluitenberg and Horton (1989) show this to be especially true with low intensity storms. Low intensity storms may yield 70% or more old water in the outflow. Pilgrim et al (1979) and Pearce (1990) found that in storms following dry periods, the majority of runoff has old water signatures.

At first glance it seems impossible that old water would dominate runoff because significant portions of the flow occur through preferential flow paths (Wilson et al, 1990; Germann and Bevin, 1982; Elrick and French, 1966; Wild, 1972). However, two plausible theories, each being applicable in specific cases, have been presented which explain the release of old water from preferential flow paths.

The first theory, presented by McDonnell (1990), states that water infiltrates rapidly downward through preferential flow. Upon reaching a zone of decreased permeability, a perched water table forms, saturating the matrix and allowing for chemical exchange resulting in a switch of concentration signatures to old water. This perched water table then drains through preferential flow paths to the outlet. This suggests that a high intensity storm could also be dominated by old water unless the retention time has an effect on the rate of chemical exchange.

The other theory suggests that water infiltrates into preferential flow paths at the soil surface but is diffused into the matrix before penetrating to depth (Horton and Hawkins, 1965). Pores in the matrix will simultaneously be filling with water allowing matrix flow to occur. As the matrix saturates, old water is displaced into preferential flow paths carrying solutes with it (Jabro et al, 1991; Jardine et al, 1990; Kennedy et al, 1986, Luxmoore et al, 1990).

In the Ouachita Mountains, rapid subsurface flow has been shown to occur at velocities greater than those predicted using Darcy's Law, indicating preferential flow paths are involved in streamflow generation (Williams, 1991; Turton et al, 1992). However, little is known about the new/old water relationships in subsurface flow. This study was conducted to determine the percentages of old and new water released from a soil block under various simulated rainfall intensities.

METHODS AND PROCEDURES

Tracers

To determine the displacement of old water or release of new water, a tracer study was conducted. A tracer study where the output and input tracer concentrations are known and the flow rate of the input and the output can be measured will allow for the calculation of the mixing ratios of new and old water.

Many studies have used naturally occurring radioisotopes including O^{18}, deuterium and tritium. Although these isotopes are suitable for use as tracers because they move with the water, using them as tracers may lead to questionable results. It is often difficult to separate concentration signatures of the rain (new) water and the soil (old) water because there is no method for predicting the concentrations of a given storm. Also, the concentration of isotopes varies within storms. With the added effects of storage of the isotopes between storms and the uncertainty of the source areas and flow mechanisms responsible for runoff generation, it is difficult to accurately determine the flow components to calculate the mixing ratios. A better choice would be a tracer that can be more easily controlled.

Bromide was chosen for this experiment because applications can be controlled easily with the simulated rainfall. It also possesses the five most important characteristics of a tracer. Bromide is nontoxic, not sorbed or chemically altered, not biologically altered, is easy to measure, and occurs naturally in extremely low amounts at the site (Levy and Chambers, 1987; Davis et al, 1980; Bowman, 1984). In preliminary samples of lateral flow taken from our soil plot, no bromide was detected.

Site Description

This study was carried out on watershed 11 in the Alum Creek Experimental Forest in the Ouachita National Forest near Jessieville, Arkansas (Fig. 1). The vegetation consists of a mixed pine-hardwood, primarily shortleaf pine (*P. echinata*) and oaks (*Quercus* spp.) overstory with a low understory consisting of blueberries (*Vaccinium* spp.) and poison ivy (*Toxicodendron radicans*).

The soils on the study site are of the Alamance series (Typic Hapludult). This series is well to moderately well drained with low permeability in the B horizons. The series formed in a thin layer of loamy material with underlying clayey material from weathered shale. This series is characterized by gravelly loam A1 and E horizons (0-4") underlain by a clay loam B_t1 horizon (4-9"), followed by B_t21 (9-17") , B_t22 (17-25") and B3 (25-32") clay horizons. The parent material consists primarily of fractured shale/sandstone (Robinson, 1964). The soil depth averaged 90 cm to bedrock with a variation of about ±5 cm.

Field Methods

A pedon measuring 2.05 m by 6.3 m by .8 m deep (Figure 2) was selected for this study. One problem encountered in soil plot studies is the effect of boundaries on the flow of water (Thomas and Phillips, 1979). To minimize the effect of boundaries, a buffer of approximately one meter was established on both sides of the pedon. To prevent natural rainfall from entering the plot, a tarp was suspended over the top and a plastic sheet barrier was buried down to the depth of the bedrock around the outside of the buffer strips and the upslope end.

Soil moisture was measured by the neutron attenuation method (Klute, 1986). Six access tubes were located on the boundary between the plot and the buffer. Measurements were taken at three depths (20, 50, and 80 cm) before and after each storm to determine the amount of water being stored in the block (Table 1).

Outflow from the plot was separated into four depths, 14 cm (O1,O2,A1, and E horizons), 26 cm (B_t1 horizon), 44 cm

(B_t21 horizon), and 67 cm (B_t22 horizon) from the surface (Figure 2). The soil face was cut and plastic sheets were inserted a few centimeters to separate the flow into four troughs. The outflow rate was monitored using tipping buckets, one for each trough. Each tipping bucket was fitted with a magnet that momentarily closed a magnetic proximity switch. Pulses were accumulated at one minute increments by a datalogger (Campbell Scientific 21x).

Rainfall simulations

Twelve rainfalls, three repetitions each of four intensities (6.3, 4.4, 3.0, 1.2 cm/hr) were simulated. Bromide was dissolved in the tank supplying the rainfall simulator so it could be applied with the rainfall. Each bromide application was followed by two non-bromide applications in an attempt to flush the bromide from the soil and to ensure that a measurable difference in bromide concentrations existed between the old and new water.

The water was applied using a rainfall simulator supplied by a gravity fed water tank. Industrial nozzles were installed in a swinging rack to ensure uniform application of the rain. Water pressure was regulated throughout the simulation to ensure a constant flow rate. The simulations continued until a steady subsurface outflow was achieved. Tipping buckets were used to determine the flow volumes and rates. A calibration curve established in the lab for each tipping bucket was used to convert the number of tips per minute, as counted by a datalogger, to flow rate in l/min.

Four samples were periodically taken from the rainfall simulator during each storm to measure the concentration of bromide applied with the rainfall (Table 2).

Sample Analysis

Samples of subsurface outflow were collected at varying intervals during the rainfall simulations. The samples (20 ml) were taken before the water reached the tipping buckets so adjustments for lost lateral flow volume were made. Samples were taken at short intervals in the early stages of subsurface flow because we suspected that rapid changes in tracer concentration and flow rate could occur at that time. As the runoff continued, the sampling interval was lengthened until the rainfall was shut off. Then the recession of the flow was sampled intensively because we suspected rapid changes in tracer concentrations and flow rates would occur.

Bromide concentrations were measured using an ion selective bromide electrode with a double junction reference electrode. Ionic strength adjuster (5M NaOH) was added at the rate of 2 ml/100ml of sample. Quality control was ensured by measuring a standard solution, after every eight samples, with the bromide concentration in the range of the sample concentrations. The electrode proved capable of detecting concentrations as low as 1 mg/l for our samples.

Samples with concentrations too low to be read using the probe were analyzed with an ion chromatograph, however, interference from SO_4 present in the soil water prevented accurate readings.

A mixing ratio of old and new water was calculated for simulations having one source of flow, either the simulated rainfall or the soil water, containing no bromide. These simulations were chosen to ensure that an accurate ratio could be calculated from the mass balance.

Calculations

A water balance approach was needed to establish a mass balance for bromide (Table 3). The input volume was equal to the simulation volume. The subsurface outflow was calculated using the tipping buckets and calibration curves developed in the lab for each tipping bucket . The change in storage was calculated from the neutron probe measurements from before and after each simulation. Seepage from the bottom of the pedon was calculated by subtracting the soil moistures determined by neutron probe measurements taken after a simulation and before the following storm.

The bromide mass balance was calculated using the water balance and the outflow bromide concentrations and flow rates (Table 3). The mass (g) of bromide applied (Br^-)was determined by

$$Br^- = C_r * Q \qquad (1)$$

where C_r is the simulation average bromide concentration (mg/l), and Q is the volume (l) of water applied during the simulation. The mass (g) of bromide left in the soil prior to each simulation (Br^{-}_{soil1}) was determined by

$$Br^{-}_{soil1} = (Br^{-}_{soil2}+Br^{-}_{rain})-(Br^{-}_{ro}+Br^{-}_{seep}) \qquad (2)$$

where Br^{-}_{soil2} is the mass of bromide in the soil (g) at the start of the simulation, Br^{-}_{rain} is the mass (g) of bromide applied with the rain. Br^{-}_{ro} is the mass (g) of bromide in the runoff, and Br^{-}_{seep} is the mass (g) of bromide lost to seepage. The mass balance was carried through the duration of this study to account for all of the bromide.

The concentration (mg/l) of bromide in the soil solution (C_{soil}) was determined by

$$C_{soil} = Br-_{soil}/V_{sw} \qquad (3)$$

where Br^{-}_{soil} is the mass (g) of bromide in the soil as calculated above and V_{sw} is the volume of soil water in storage as calculated from neutron probe readings (Table 1).

Mixing ratios were calculated for rainfall simulations with only one source of bromide to ensure a distinction between old and new water. Prior to storm 1, no bromide had been applied to the soil. Preliminary samples from the plot detected no bromide released from the soil so simulation 1 was used. Following simulation 1, only the simluations not applying bromide (simulations 5, 8, 10) could be used for the mixing ratios because the soil retained bromide. The volume (l) of the bromide laden (V_{Br}) water was calculated by

$$V_{br} = Br^{-}_{ro}/C_{s} \qquad (4)$$

where Br^{-}_{ro} is the mass (g) of bromide released in the outflow and C_s is the concentration (mg/l) of bromide in the source water containing bromide in the simulation. From this, the mixing ratio of old and new water can be determined by

$$\text{mixing ratio} = V_{Br}/V_{ro} *100 \qquad (5)$$

where V_{ro} is the volume of the outflow (l).

Because only one of the two sources of water, simulated rainfall or soil water, contained bromide, it was possible to determine the percent of old water using

$$\%old = C_{ro}/Br^{-}_{soil} \qquad (6)$$

where C_{ro} is the Bromide concentration of the subsurface outflow (mg/l). The new water percentage (%new) is then calculated as

$$\%new = 100\% - \%old. \qquad (7)$$

RESULTS AND DISCUSSION

Subsurface Flow

Flow from the 14 cm depth dominated the hydrographs in all cases. The hydrograph from simulation 4 (4.6 cm/h) shows that the total flow from the bottom three troughs did not equal the flow from the 14 cm trough (Fig. 3). It may be observed, however, that with lower simulated rainfall intensities the lower soil depths yielded a greater percentage of the total flow. The hydrographs from storm 10 (1.3 cm/h) are typical and demonstrate the occurrence of preferential flow from the respective depths (Fig. 4).

Subsurface outflow from the plot responded rapidly to both the start and the cessation of the rain. Turton (1992) and Williams (1991) also observed rapid responses of subsurface flow to rainfall in subsurface flow studies in the Ouachita Mountains. Subsurface outflow started from 1 to 30 minutes from the beginning of every simulation. Higher intensities produced a more rapid response to the beginning of the rainfall applications while the lower intensities responded more slowly. Since the pre-simulation soil moisture contents were found to be nearly the same at the start of each run (Table 1), the variation in the time between the start of the rainfall simulation and the initiation of subsurface outflow is due to the rainfall intensity.

The steep rising and falling limbs of the subsurface outflow hydrographs (Figures 3,4,5,6,7, and 8) indicate the occurrence of preferential flow. Flow through preferential flow paths and the soil immediately surrounding these paths was observed prior to plot saturation. These paths consisted of larger pores including root channels. As the subsurface outflow approached a steady state, water was observed seeping from the entire soil face.

Every simulation produced a hydrograph with similar trends. When the scale is enlarged enough to show a detailed hydrograph, every simulation has the same shape (Figs. 5,6,7, and 8). The lower intensities required more time to initiate subsurface outflow and to reach a steady state of subsurface outflow. The lower intensities also produced much lower flow rates.

Bromide Tracer Response

Three rainfalls were simulated at each intensity. As stated, the two simulations not applying bromide were intended to flush the bromide from the soil. The concentrations of bromide in the samples from each of the second non-bromide application after each bromide application released water with bromide concentrations below the detection limits. However this indicated a high percentage of new water released since bromide concentrations were very low.

The flow rate and percentage of old water vs. time were plotted for simulations 1, 5, 8, and 10 (Figs. 5,6,7, and 8). These simulations were chosen because either the simulated rainfall or the soil water contained no bromide, allowing for calculation of a precise mixing ratio.

The time to maximum new water concentration was dependent on the simulated rainfall intensity. As simulated rainfall intensity decreased, more time was required to achieve maximum new water concentrations (or minimum old water concentrations) which occurred at a steady state of subsurface outflow (Figures 5 and 8).

Old water concentrations were highest at the earliest stages of flow in all cases. However, the more intense the storm, the lower the maximum percentage of old water resulted, indicating that the release of old water is inversely related to the intensity. The higher intensities had maximum old water concentrations of about 30% while the lower intensities had a maximum of 70% old water. In all cases, the maximum value was measured during the initial stages of flow. As the simulations progressed, the concentration of old water decreased until the simulated rainfall was stopped at steady state lateral flow, after which the concentration of old water increased somewhat until subsurface outflow ceased.

Percentages of New and Old Water

For high intensity simulations (6.3 and 4.3 cm/hr) new water concentrations reached a maximum of 100% (0% old water) from the 14 and 26 cm soil depths (Fig. 5 and 6). The middle intensity (3.0 cm/hr) produced new water concentrations as high as 98% (2% old water)(Fig.7). The lowest intensity (1.15 cm/hr) produced 84% new water maximum concentration (16% old water)(Fig. 8). All maximum values were observed at the steady state of subsurface outflow which is also the peak flow rate for the hydrograph.
For the middle intensity simulation (4.3 cm/hr), the total old water released was about 8.6 L. The total subsurface outflow was 542 L. This shows that only 1.5% of the subsurface outflow was old water. The high intensity storms yielded only 0.9% of old water. The amount of old water released from a lower/middle intensity simulation (2.8 cm/hr) was only 2.2% of the total outflow. The 1.3 cm/hr

simulations produced the highest percentage of old water, 34%. These findings are consistent with those of Luxmoore et al (1990) and Kluitenberg and Horton (1989) both of whom found that high intensity rainfalls yield more new water in streamflow.

A Proposed Mechanism for Mixing of Old and New Water

Soils similar to the Alamance soils found in the Alum Creek Experimental Forest in the Ouachita National Forest yield a much greater volume of new water than old water in subsurface outflow generated during storms. One possible explanation for the observations and results of the tracer study is that old water mixes with new water as it flows through macropores. It appears that subsurface outflow of old water starts as old water near preferential flow paths is either displaced or mixed with new water and flows down gradient. As the influx of new water continues, the old water near the macropores is depleted. The soil matrix then becomes the source for old water during the rest of the simulation. Since the flow rate through the matrix is restricted by the hydraulic conductivity of the soil matrix and preferential flow is not, preferential flow paths can release a greater volume of water than the matrix. As a result, more new water is released during this stage.

Old water is released at a relatively steady rate from the matrix as compared to the preferential flow paths. Because the new water draining through preferential flow paths flows more rapidly, it can dilute the old water being released by the matrix. This can be observed upon examination of the hydrograph trends. There is an inverse relationship between the flow rate and the percent of old water. During receeding flows, the water in the preferential flow paths becomes depleted more rapidly than the matrix water so the signature of subsurface outflow swings toward that of old water again (Figures 5,6,7,8). The greater volume of old water released from the low intensity simulation indicates that the flow though the preferential flow paths is not as dominant in the subsurface outflow as it was with the higher intensity storms.

The nature of the generation of subsurface flow is dependent on the intensity of the storm as well. Because water flows through the matrix at a relatively constant rate, that flow becomes more diluted as the intensity increases thus resulting in a greater percentage of new water released.

It is also important to note that a greater volume of old water was released during low intensity simulations than any others despite a lower total outflow. This indicates that the release of old water was not dependent on rainfall volumes.

SUMMARY

In summary, we found the following:

1. New water was dominant for all rainfall intensities

simulated for this study. The higher the intensity the higher maximum percentage of new water released in the subsurface flow.

2. The greatest percentages of old water occurred during early stages of flow.
3. Maximum old water concentrations ranged from 30% for high intensities (6.27 cm/h) to 70% for low intensities (1.31 cm/h).
4. Maximum new water concentrations ranged from 100% for the higher intensities to 84% for the lowest intensity (1.04 cm/h). The maximum new water concentrations coincided with the peak flow rate for each simulation.
5. Total outflows of old water ranged from less than 1% for the highest rainfall intensity (6.27 cm/h) to 34% for the lowest intensity (1.04 cm/h). There was a large change in percentage of old water in the total outflows between the 2.8 cm/hr simulations (2.2%) and the 1.3 cm/hr simulations (34%).
6. The volume of old water released during a storm was not dependent on the rainfall volume.

Table 1. Soil moisture contents (% by volume) before and after simulated storms as determined using a neutron probe.

	Simulation Number					
	4	5	7	8	9	10
moisture before	29.3	30.0	28.8	29.5	28.4	28.5
moisture after	29.6	30.3	29.2	29.8	28.8	28.9

Table 2. Table of simulated storm characteristics.

Simulat'n Number	Date	Rainfall Depth (cm)	Rainfall Duration (hrs)	Rainfall Intensity (cm/h)	Return Period (years)	Bromide Concentration (mg/l)
1	07/24/91	5.6	.9	6.27	4	48.1
4	08/01/91	7.6	1.67	4.58	6	43.4
5	08/02/91	6.7	1.55	4.32	5	0
7	08/07/91	5.8	1.75	3.31	3	38.1
8	08/08/91	5.4	1.92	2.80	1.5	0
9	10/08/91	4.4	4.25	1.04	1	51.6
10	10/09/91	4.0	3.08	1.31	1	0

Table 3. Bromide mass balance. All masses (g) calculated by subtraction of inputs and outputs. Concentrations (mg/l) calculated using water content before the storm.

	Simulation Number						
	1	4	5	7	8	9	10
Br^- in	62.8	42.8	0.0	22.1	0.0	29.5	0.0
Br^- in soil	0.0	39.3	54.9	54.2	65.7	63.3	85.7
Total Br^-	62.8	82.1	54.9	76.3	65.7	92.8	85.7
Br^- out	22.9	27.0	.02	9.3	0.2	4.7	1.5
Br^- storage	39.9	55.1	54.7	67.0	65.5	88.1	84.2
Br^- seep	0.2	0.2	0.5	1.3	1.1	2.3	1.6
Br^- in soil	39.7	54.9	54.2	65.7	64.5	85.7	82.6
Equiv. conc.	n/a	23.1	23.0	27.8	27.5	36.8	34.5

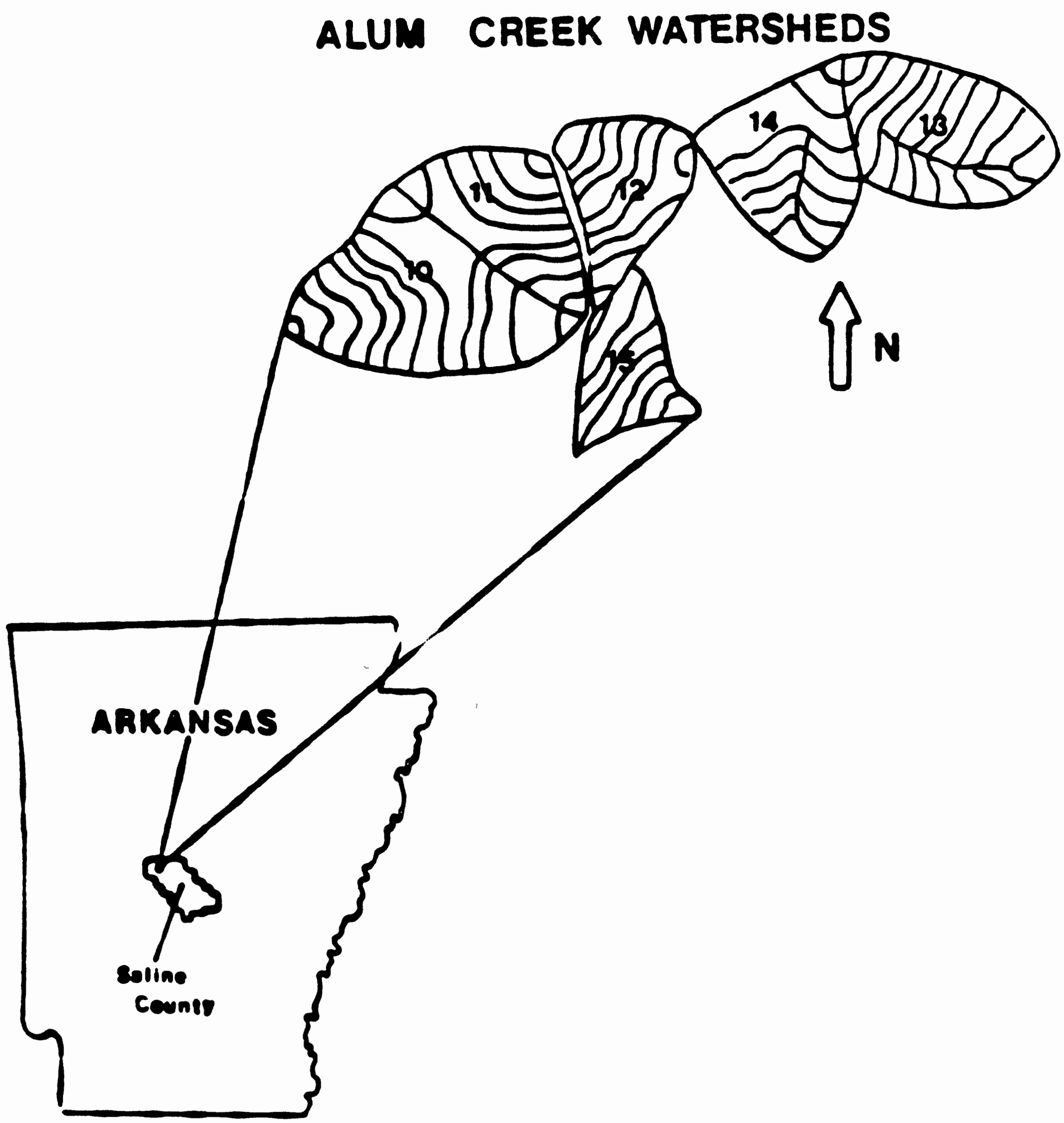

Figure 1. Location map of the Alum Creek Cooperative Watersheds (Modified from Miller et. al., 1988).

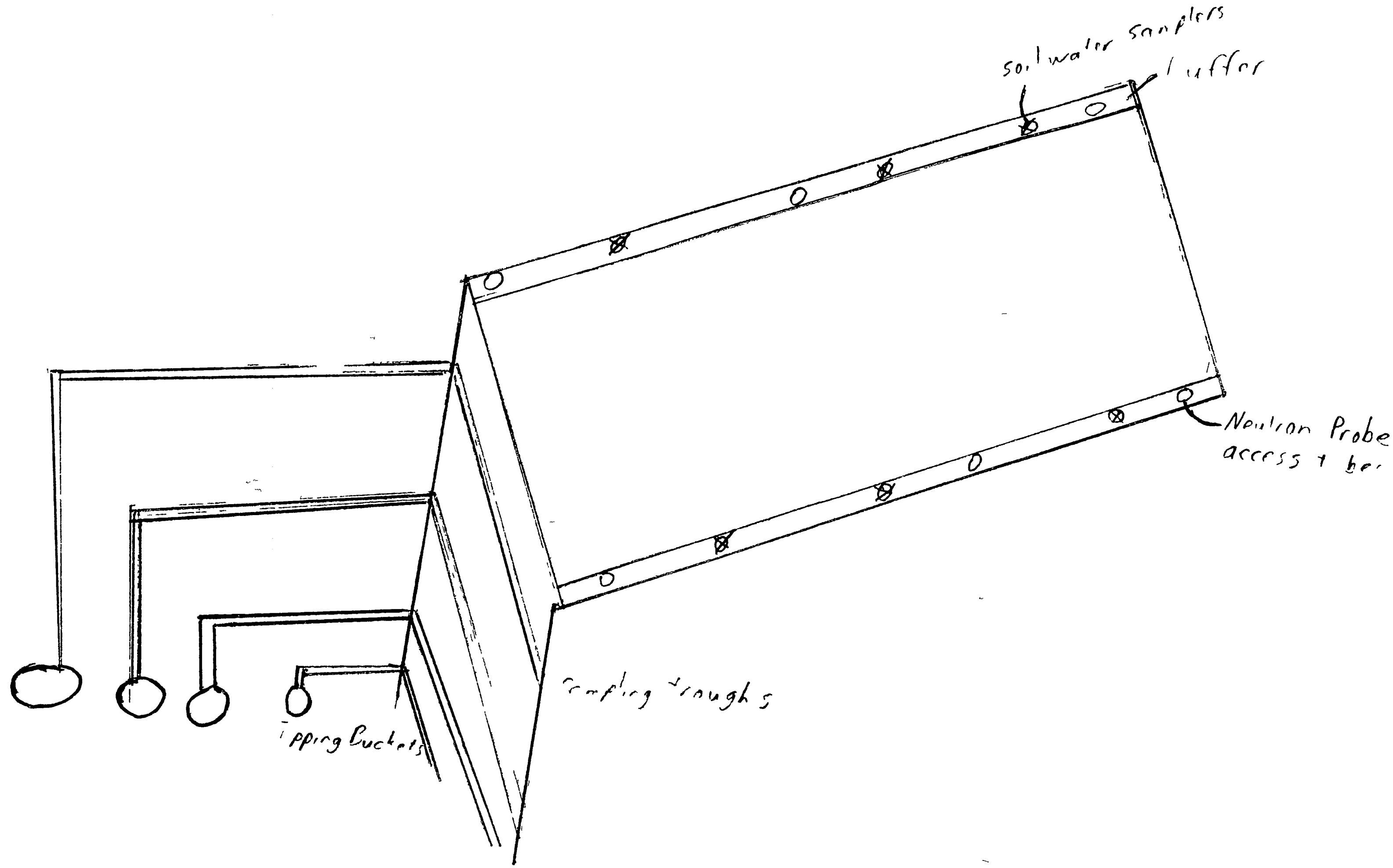

Fig. 2. Schematic of soil block with runoff collection troughs

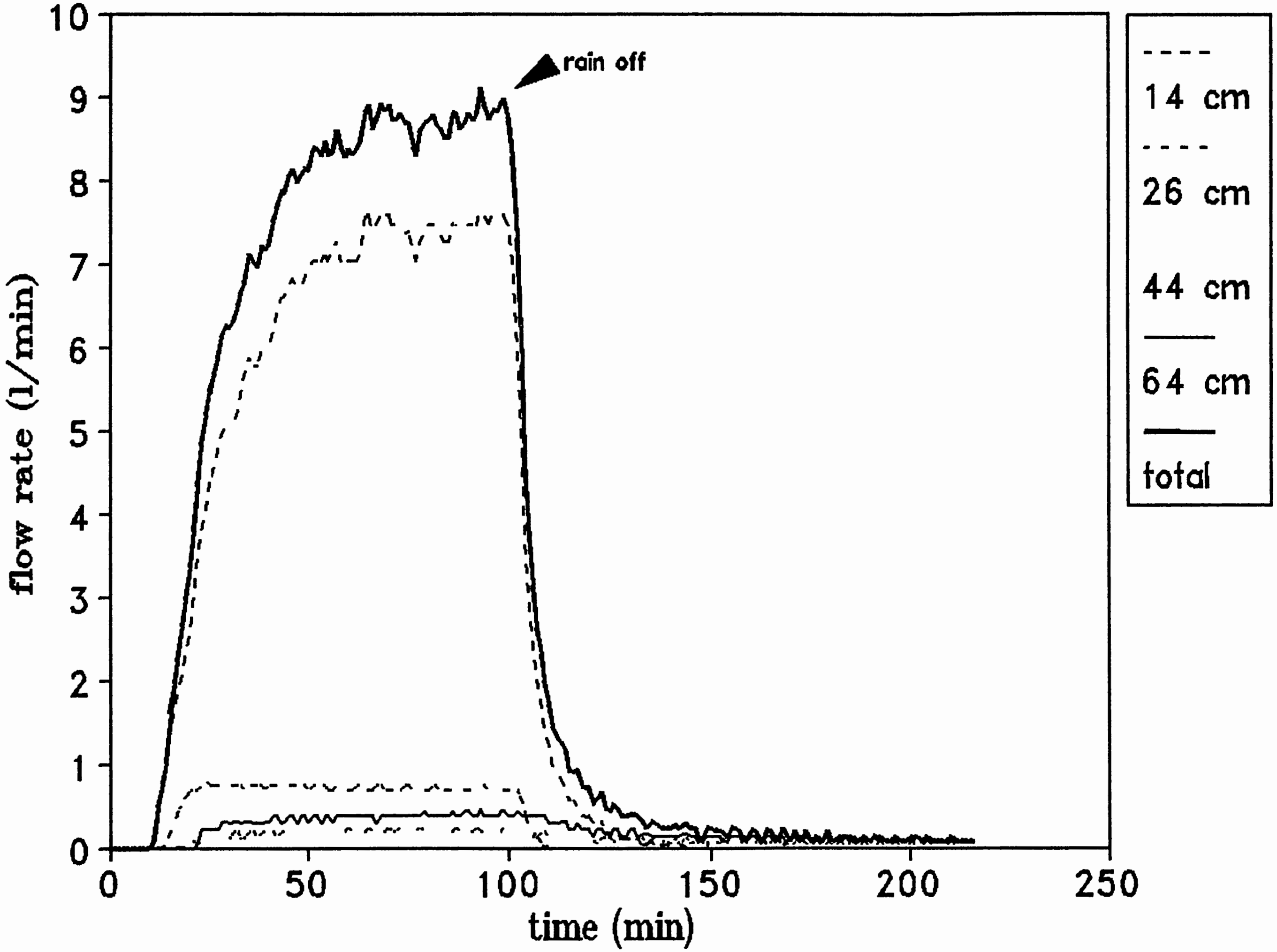

Fig. 3. Total hydrograph of a 4.6 cm/h simulation (simulation 4) showing total flow and flow from individual troughs.

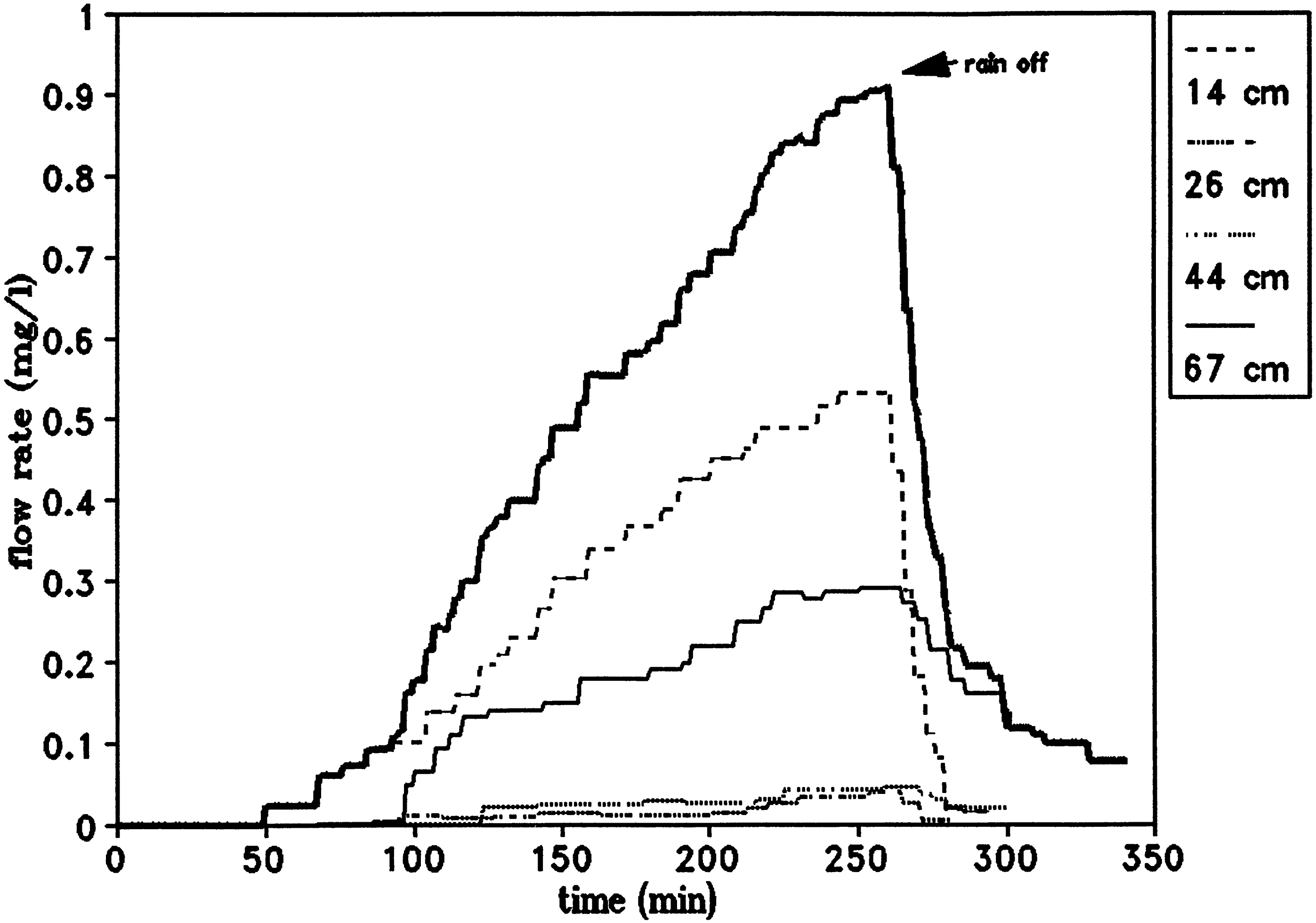

Fig. 4. Hydrograph of a 1.0 cm/h simulation (simulation 9) showing total flow and flow from individual troughs.

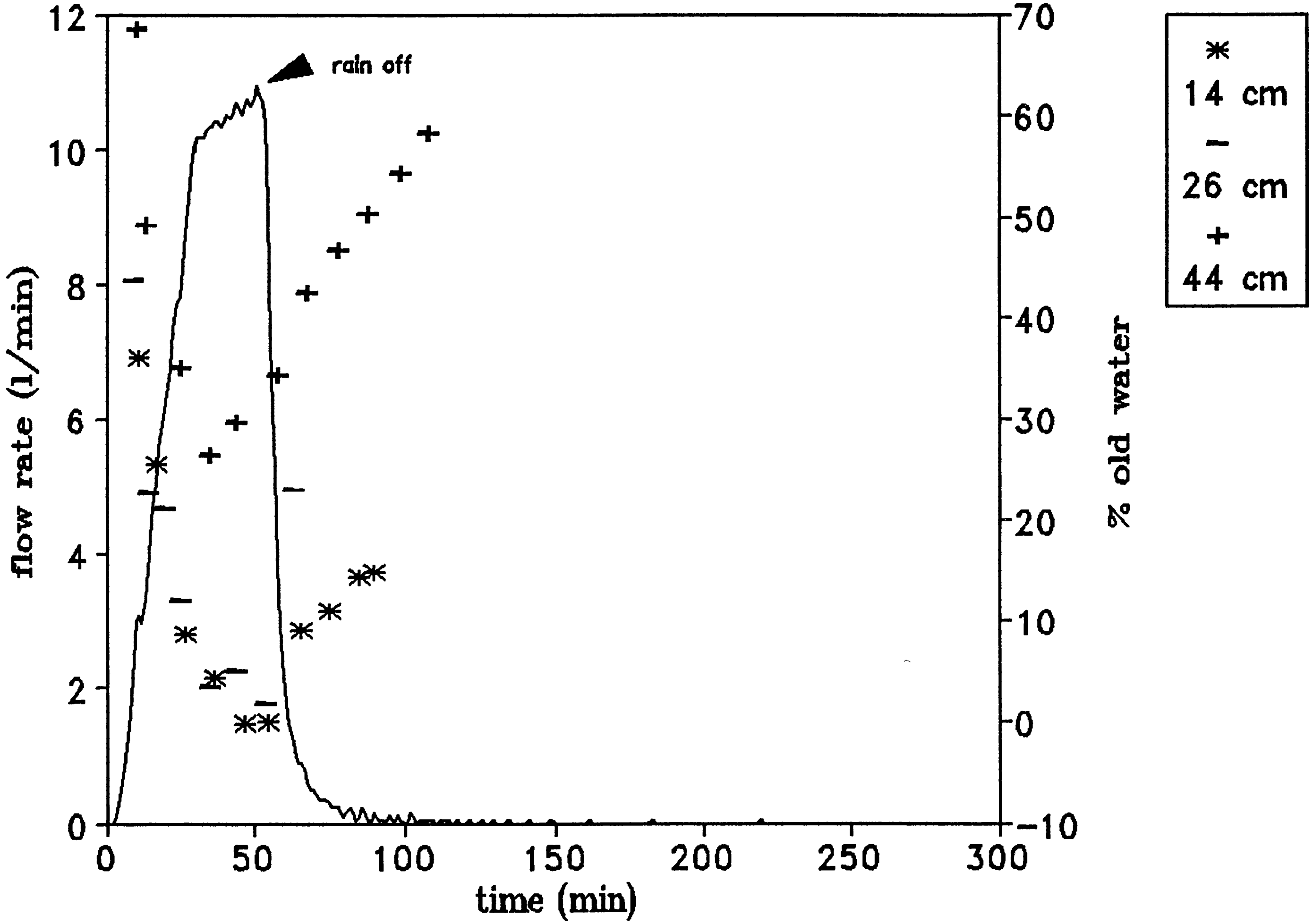

Fig. 5. Plot of total lateral flow and bromide breakthrough curves for a 6.3 cm/h simulation (simulation 1). Percent old water is expressed as ratio of Br- concentration in outflow to Br- in precipitation water times 100 subtracted from 100.

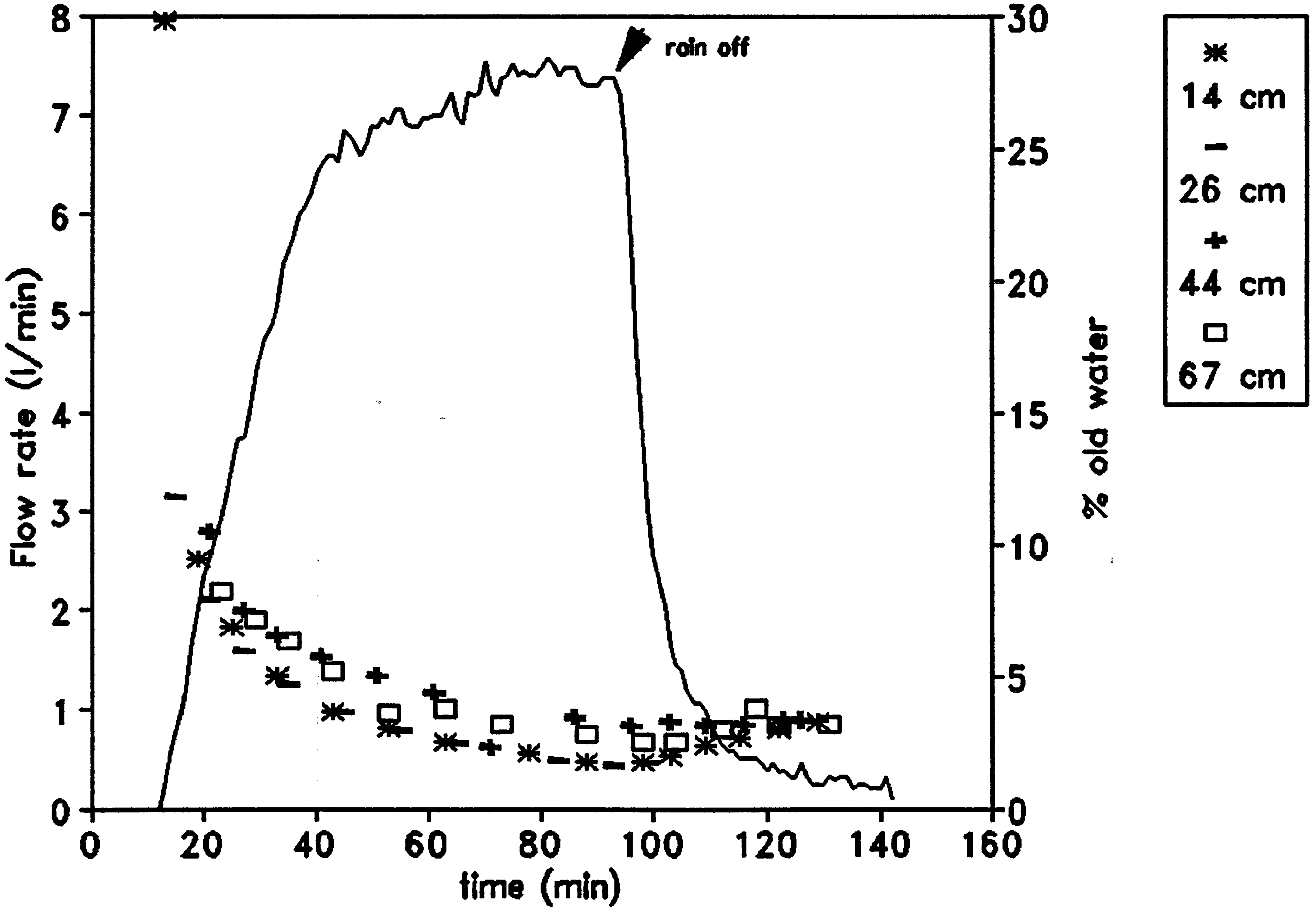

Fig. 6. Plot of total lateral flow and bromide breakthrough curves for a 4.3 cm/h simulation (simlation 5). Percent old water is expressed as ratio of Br- concentration in outflow to Br- in soil water times 100.

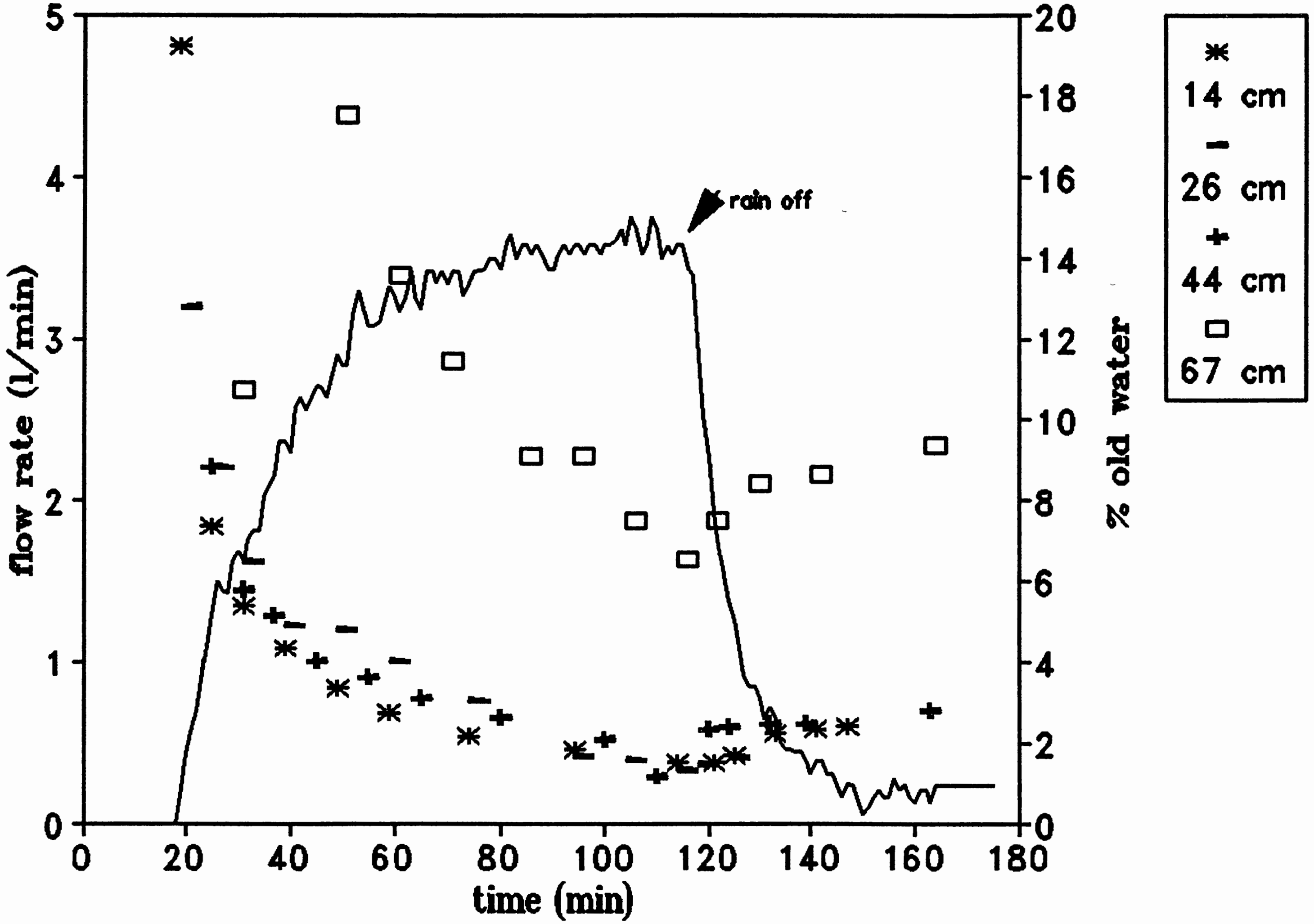

Fig. 7. Plot of total lateral flow and bromide breakthrough curves for a 2.8 cm/h simulation (simulation 8). Percent old water is expressed as ratio of Br- concentration in outflow to Br- in soil water times 100.

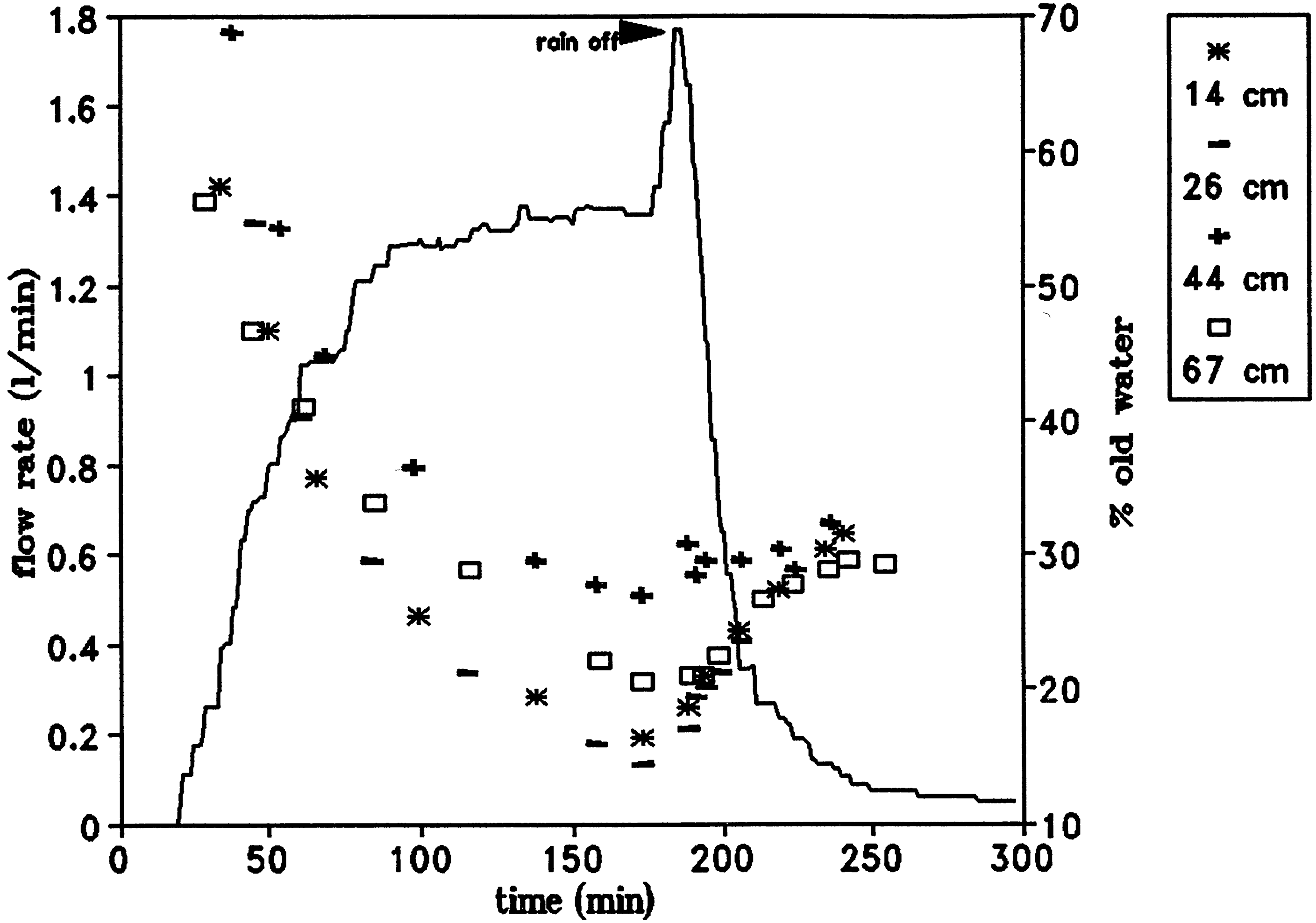

Fig. 8. Plot of total lateral flow and bromide breakthrough curves for a 1.3 cm/h simulation (simulation 10). Percent old water is expressed as ratio of Br- concentration in outflow to Br- in soil water times 100.

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APPENDICES

APPENDIX A

Water Balance

Table 4. Water balance showing starting volumes, simulated rainfall volumes, subsurface flow, and seepage for each simulation. All volumes are in liters.

	Event number						
	1*	4	5	7	8	9	10
Initial vol.	n/a	2425	2379	2450	2366	2240	2329
Precip. vol	728	985	865	748	694	570	522
Runoff vol.	518	747	542	346	322	120	219
Precip-R.O.	210	238	323	402	372	450	303
ΔStorage during	n/a	40	150	1	132	129	72
Seepage	n/a	198	173	401	240	321	231
ΔStorage after	n/a	-84	-174	-60	-154	-40	n/a
Net change	n/a	114	-1	341	86	281	231
Ending vol.	n/a	2379	2356	2366	2344	2329	2395#

* Neutron probe data not available for simulation 1.
#Data soes not include post simulation runoff.

APPENDIX B

Runoff and Concentration Data for Listed Simulations

Table 5 Runoff and bromide concentration data for listed simulations
Simulation 1 (bromide application)

Time (min)	14 cm Br conc (mg/l)	14 cm Q1 (l/min)	26 cm Br conc (mg/l)	26 cm Q2 (l/min)	44 cm Br conc (mg/l)	44 cm Q3 (l/min)
0		0		0		0
1		0		0		0
2	0	0		0		0
3		0 10456		0		0
4		0 30145		0		0
5	0	0 49834		0		0
6		0 82648	0	0		0
7		1 15462		0 13197		0
8		1 28588		0 33892		0
9		1 74528	27	0 4079		0
10		2 60052		0 4079	15 1	0
11	30 7	2 60052		0 47689		0
12		2 42708		0 54587		0
13		2 7765		0 54587	24 4	0
14		3 13574	37 1	0 61485		0
15		3 50413		0 68384		0 05852
16		3 97666		0 68384		0 05852
17	35 8	4 36373		0 68384		0
18		4 75839		0 75282		0 05852
19		5 05915		0 75282		0 12538
20		5 26184	37 9	0 75282		0 12538
21		5 56907		0 8218		0 12538
22		5 88002		0 8218		0 05852
23		6 40622		0 8218		0 12538
24		6 72655		0 8218		0 19224
25		6 94197	42 3	0 75282	31 2	0 12538
26		7 37715		0 75282		0 12538
27	43 9	7 81797		0 8218		0 12538
28		8 26424		0 8218		0 19224
29		8 7158		0 8218		0 19224
30		9 05784		0 8218		0 12538
31		9 17248		0 8218		0 19224
32		9 17248		0 8218		0 19224
33		9 17248		0 8218		0 19224
34		9 28744		0 8218		0 19224
35		9 4027	46 4	0 75282	35 4	0 19224
36		9 4027		0 75282		0 19224
37	46	9 4027		0 8218		0 19224
38		9 4027		0 8218		0 19224
39		9 4027		0 75282		0 19224
40		9 4027		0 75282		0 2591
41		9 51827		0 8218		0 19224
42		9 51827		0 75282		0 19224
43		9 51827		0 75282		0 2591
44		9 63415	45 6	0 8218	33 8	0 2591
45		9 63415		0 75282		0 2591
46		9 51827		0 75282		0 2591
47	48 2	9 63415		0 8218		0 19224
48		9 75033		0 8218		0 19224
49		9 63415		0 75282		0 2591
50		9 75033		0 75282		0 2591
51		9 86681		0 8218		0 2591
52		9 75033		0 8218		0 2591
53		9 63415		0 8218		0 2591
54		9 4027	47 2	0 75282		0 2591
55	48 1	8 15217		0 75282		0 2591
56		6 19457		0 68384		0 2591
57		4 56014		0 4079		0 2591
58		3 41121		0 26993	31 5	0 19224
59		2 60052		0 13197		0 19224
60		2 0078		0		0 19224
61		1 61402		0		0 19224
62		1 28588		0		0 19224
63		1 08899	37	0		0 12538
64		0 89211		0		0 12538
65		0 76085		0		0 12538
66	43 7	0 62959		0 06298		0 19224
67		0 56397		0 06298		0 19224
68		0 49834		0	27 6	0 12538
69		0 36708		0		0 12538

Table 5 (con t)
Simulation 1 (bromide application)

Time (min)	14 cm Br conc (mg/l)	14 cm Q1 (l/min)	26 cm Br conc (mg/l)	26 cm Q2 (l/min)	44 cm Br conc (mg/l)	44 cm Q3 (l/min)
70		0 36708		0		0 12538
71		0 30145		0		0 12538
72		0 23582		0		0 12538
73		0 23582		0		0 12538
74		0 23582		0		0 12538
75	42 8	0 17019		0		0 12538
76		0 10456		0		0 12538
77		0 10456		0		0 12538
78		0 10456		0	25 6	0 12538
79		0 10456		0		0 05852
80		0 03894		0		0 05852
81		0 03894		0		0 12538
82		0 10456		0		0 12538
83		0 03894		0		0 12538
84		0		0		0 05852
85	41 2	0 03894		0		0 05852
86		0 03894		0 06298		0 12538
87		0		0 06298		0 12538
88		0			23 9	0 05852
89		0				0 05852
90	41	0 03894				0 12538
91		0 03894				0 05852
92		0				0 05852
93		0				0 05852
94		0				0 05852
95		0				0 12538
96		0				0 05852
97		0				0 05852
98		0				0 12538
99		0			21 9	0 05852
100		0				0
101		0				0 05852
102		0 03894				0 12538
103		0 03894				0 05852
104						0
105						0 05852
106						0 05852
107						0 05852
108					20	0 05852
109						0 05852
110						0 05852
111						0
112						0 05852
113						0 05852
114						0 05852
115						0 05852
116						0
117						0 05852
118						0 05852
119						0
120						0
121						0 05852
122						0 05852
123						0
124						0
125						0 05852
126						0 05852
127						0
128						0
129						0 05852
130						0 05852
131						0
132						0
133						0
134						0 05852
135						0 05852
136						0
137						0
138						0

Table 5 (con t)
Simulation 1 (bromide application)

Time (min)	14 cm Br conc (mg/l)	14 cm Q1 (l/min)	26 cm Br conc (mg/l)	26 cm Q2 (l/min)	44 cm Br conc (mg/l)	44 cm Q3 (l/min)
139						0
140						0
141						0 05852
142						0 05852
143						0
144						0
145						0

Table 5 (con t)
Simulation 2 (Non bromide application)

Time (min)	14 cm Br conc (mg/l)	14 cm Q1 (l/m)	26 cm Br conc (mg/l)	26 cm Q2 (l/m)	44 cm Br conc (mg/l)	44 cm Q3 (l/m)	67 cm Br conc (mg/l)	67 cm Q4 (l/m)
0		0		0		0	0 19	0
1		0		0		0		0 07097
2		0		0		0		0 07097
3		0		0		0		0
4		0		0		0		0
5	4 2	0		0		0		0
6		0 10456		0		0	0 31	0 07097
7		0 30145		0		0		0 22329
8		0 62959	1	0		0		0 22329
9		1 15462		0 26993		0		0 22329
10	0 85	1 74528		0 47689	0 84	0		0 29945
11		2 6882		0 54587		0		0 29945
12		3 69159		0 68384		0	0 38	0 37561
13		4 65904	0 69	0 68384		0 05852		0 45177
14		5 56907		0 75282		0 12538		0 52793
15		6 51262		0 8218		0 05852	0 38	0 52793
16	0 63	7 48683		0 75282	0 57	0 05852		0 45177
17		8 15217		0 75282		0 12538		0 52793
18		8 7158		0 75282		0 12538	0 41	0 52793
19		9 05784	0 55	0 68384	0 51	0 12538		0 52793
20		9 4027		0 75282		0 05852		0 60409
21		9 51827		0 75282		0 12538		0 60409
22		9 63415		0 68384	0 45	0 12538		0 60409
23		9 86681		0 75282		0 05852		0 60409
24	0 46	9 86681		0 75282		0 12538		0 60409
25		9 86681		0 75282	0 41	0 12538		0 60409
26		9 86681		0 75282		0 12538		0 60409
27		9 98358		0 68384		0 19224	0 34	0 60409
28		10 1007	0 37	0 75282		0 19224		0 60409
29		10 1007		0 75282		0 12538		0 60409
30		10 1007		0 75282	0 41	0 12538		0 60409
31		10 1007		0 75282		0 12538		0 60409
32		10 218		0 68384		0 12538		0 60409
33		10 3357		0 75282		0 12538		0 60409
34	0 3	10 218		0 75282		0 12538		0 68025
35		10 218		0 75282	0 38	0 12538		0 68025
36		10 3357		0 75282		0 12538		0 60409
37		10 218		0 75282		0 12538	0 27	0 60409
38		10 3357	0 29	0 75282		0 19224		0 60409
39		10 4536		0 68384		0 19224		0 60409
40		10 4536		0 75282		0 12538		0 68025
41		10 4536		0 75282		0 12538		0 68025
42		10 3357		0 75282		0 12538		0 60409
43		10 3357		0 75282		0 19224		0 60409
44	0 2	10 4536		0 68384		0 19224		0 68025
45		10 4536		0 75282	0 34	0 12538		0 68025
46		10 4536		0 75282		0 12538		0 60409
47		10 4536		0 75282		0 19224	0 23	0 68025
48		10 5719	0 22	0 75282		0 19224		0 68025
49	0 2	10 6904		0 68384		0 12538		0 68025
50		10 5719		0 68384	0 33	0 12538		0 68025
51		10 1007		0 75282		0 12538		0 60409
52		9 05784		0 75282		0 19224	0 23	0 60409
53		7 37715	0 23	0 68384		0 19224		0 52793
54	0 25	5 56907		0 61485		0 12538		0 52793
55		4 26624		0 47689	0 33	0 12538		0 52793
56		3 41121		0 33892		0 12538		0 45177
57		2 86542		0 26993		0 12538	0 26	0 37561
58		2 25629	0 25	0 13197		0 12538		0 37561
59		1 81091		0 06298		0 12538		0 45177
60		1 5484		0 06298		0 12538		0 37561
61		1 28588		0		0 05852		0 37561
62		1 08899		0		0 05852		0 37561
63		0 95774	0 28	0 06298		0 12538		0 29945
64	0 34	0 82648		0 06298		0 12538		0 29945
65		0 76085			0 37	0 05852		0 29945
66		0 69522				0 05852		0 29945
67		0 56397				0 05852	0 29	0 29945
68		0 49834				0 05852		0 22329
69		0 49834				0 05852		0 22329

Table 5 (con t)
Simulation 2 (Non bromide application)

Time (min)	14 cm Br conc (mg/l)	14 cm Q1 (l/m)	26 cm Br conc (mg/l)	26 cm Q2 (l/m)	44 cm Br conc (mg/l)	44 cm Q3 (l/m)	67 cm Br conc (mg/l)	67 cm Q4 (l/m)
70		0 43271				0		0 29945
71		0 36708				0 05852		0 29945
72		0 36708				0 05852		0 29945
73		0 30145				0 05852		0 22329
74	0 41	0 30145				0 05852		0 22329
75		0 30145			0 39	0 05852		0 22329
76		0 23582				0 05852		0 22329
77		0 23582				0		0 22329
78		0 23582				0 05852		0 22329
79		0 17019				0 05852		0 22329
80		0 17019				0 05852		0 22329
81		0 17019				0 05852		0 22329
82		0 10456				0		0 22329
83		0 17019				0 05852		0 22329
84	0 45	0 17019				0 05852		0 14713
85		0 10456			0 44	0		0 22329
86		0 10456				0		0 22329
87		0 10456				0 05852	0 33	0 14713
88		0 10456				0 05852		0 14713
89		0 03894				0		0 22329
90		0 03894				0 05852		0 22329
91		0 10456				0 05852		0 14713
92		0 03894				0		0 14713
93		0 03894				0		0 14713
94	0 49	0 10456				0 05852		0 22329
95		0 03894				0 05852		0 22329
96		0 03894				0		0 14713
97		0 03894				0		0 14713
98		0 03894				0 05852		0 14713
99		0 03894				0 05852		0 14713
100		0 03894				0		0 14713
101		0 03894				0		0 14713
102		0				0 05852		0 14713
103		0 03894				0 05852		0 14713
104	0 53	0 03894				0		0 14713
105		0				0		0 22329
106		0				0 05852		0 22329
107		0 03894				0 05852	0 34	0 14713
108		0 03894			0 52	0		0 07097
109		0				0		0 14713
110		0 03894				0		0 14713
111		0 03894				0		0 14713
112		0				0 05852		0 14713
113		0 0267				0 05852		0 07097
114		0 03894				0		0 14713
115		0 03894				0		0 14713
116		0				0 05852		0 14713
117		0				0 05852		0 22329
118		0 0267				0		0 22329
119		0				0		0 14713
120		0 03894				0		0 14713
121		0 03894				0		0 14713
122		0				0 05852		0 14713
123		0				0 05852		0 14713
124		0				0		0 07097
125		0				0		0 07097
126		0				0		0 14713
127		0				0	0 45	0 14713
128		0				0 05852		0 14713
129		0 03894				0 05852		0 14713
130		0 03894				0		0 14713
131						0		0 14713
132						0		0 07097
133						0		0 07097
134						0 05852		0 14713
135						0 05852		0 14713
136						0		0 14713
137						0		0 14713
138						0		0 14713

Table 5 (con t)
Sımulatıon 2 (Non bromıde applıcatıon)

Tıme (mın)	14 cm Br conc (mg/l)	14 cm Q1 (l/m)	26 cm Br conc (mg/l)	26 cm Q2 (l/m)	44 cm Br conc (mg/l)	44 cm Q3 (l/m)	67 cm Br conc (mg/l)	67 cm Q4 (l/m)
139						0		0 07097
140						0		0 07097
141						0 05852		0 14713
142						0 05852		0 14713
143						0		0 14713
144						0		0 07097
145						0		0 07097
146						0		0 14713
147						0		0 14713
148						0		0 14713
149						0 05852		0 07097
150						0 05852		0 07097
151						0		0 14713
152						0		0 14713
153						0		0 14713
154						0 05852		0 60409
169						0 12538		1 1372
179						0 05852		0 90873
189						0		0 29945

Table 5 (con t)
Simulation 4 (bromide application)

Time (min)	14 cm Br conc (mg/l)	14 cm Q1 (l/min)	26 cm Br conc (mg/l)	26 cm Q2 (l/min)	44 cm Br conc (mg/l)	44 cm Q3 (l/min)	67 cm Br conc (mg/l)	67 cm Q4 (l/min)
0		0		0		0		0
1		0		0		0		0
2		0		0		0		0
3		0		0		0		0
4		0		0		0		0
5		0		0		0		0
6		0		0		0		0
7		0		0		0		0
8		0		0		0		0
9		0		0		0		0
10		0 01		0		0		0
11	18	0 11456		0		0		0
12		0 49834		0 01		0		0
13		0 77085	24 9	0 01		0		0
14	25 8	0 96774		0 06298		0		0
15		1 41714		0 21095		0		0
16		1 68965	27 2	0 27993		0		0
17	27	1 82091		0 4079		0 01		0 01
18		2 08825		0 55587	16 6	0 01	15 2	0 01
19		2 35135	29 1	0 62485		0		0
20	28 7	2 61052		0 68384		0 06852		0
21		3 04505		0 69384	20 2	0 06852		0
22		3 51413	30 8	0 69384		0 05852		0 08097
23	31 3	3 7961		0 75282		0 06852	19 6	0 23329
24		4 0727		0 8318	22 3	0 06852		0 22329
25		4 37373	32 7	0 76282		0 12538		0 23329
26	33 1	4 57014		0 75282		0 13538	20 9	0 23329
27		4 75839		0 76282	24 1	0 13538		0 22329
28		4 95845	33 7	0 76282		0 12538		0 30945
29		5 05915		0 75282		0 13538	22 8	0 30945
30		5 06915		0 75282	25 3	0 13538		0 29945
31	34	5 06915		0 75282		0 19224		0 30945
32		5 26184		0 76282		0 20224	23 5	0 30945
33		5 46624	34 9	0 76282	26 7	0 13538		0 29945
34		5 67231		0 68384		0 12538		0 30945
35		5 89002		0 75282		0 19224	24 7	0 30945
36	34 7	5 78596		0 75282		0 19224		0 29945
37		5 77596		0 76282		0 13538		0 29945
38		5 98447	36 2	0 76282	27 2	0 20224		0 29945
39		5 98447		0 68384		0 19224		0 30945
40		5 99447		0 75282		0 19224	25 9	0 30945
41	35 8	6 20457		0 75282		0 19224		0 37561
42		6 40622		0 76282		0 13538		0 37561
43		6 6194	36 3	0 76282	27 2	0 20224		0 29945
44		6 6194		0 75282		0 19224		0 30945
45		6 73655		0 75282		0 19224	26 8	0 38561
46	36 9	6 84408		0 75282		0 19224		0 37561
47		6 72655		0 76282		0 20224		0 29945
48		6 72655	38 1	0 76282	27 4	0 20224		0 37561
49		6 83408		0 75282		0 19224		0 37561
50		6 95197		0 68384		0 19224		0 30945
51	37 8	7 06023		0 75282		0 19224	27 9	0 38561
52		7 05023		0 76282		0 20224		0 37561
53		7 05023	37 7	0 76282	28 3	0 20224		0 29945
54		7 15884		0 75282		0 19224		0 37561
55		7 06023		0 68384		0 19224		0 38561
56	38 1	7 16884		0 68384		0 19224	28 4	0 30945
57		7 26782		0 76282		0 20224		0 37561
58		7 05023	38 3	0 76282	28 2	0 20224		0 37561
59		7 05023		0 68384		0 19224		0 37561
60		7 06023		0 68384		0 2591		0 38561
61	38 6	7 06023		0 68384		0 19224	29 1	0 38561
62		7 05023		0 76282		0 20224		0 37561
63		7 15884	39 4	0 76282	28 6	0 20224		0 37561
64		7 59687		0 68384		0 19224		0 37561
65		7 59687		0 68384		0 2591		0 38561
66		7 37715		0 68384		0 19224	28 9	0 38561
67		7 48683		0 76282		0 20224		0 29945
68		7 59687	39 1	0 76282	28 7	0 20224		0 37561
69		7 59687		0 68384		0 19224		0 37561

Table 5 (con t)
Simulation 4 (bromide application)

Time (min)	14 cm Br conc (mg/l)	14 cm Q1 (l/min)	26 cm Br conc (mg/l)	26 cm Q2 (l/min)	44 cm Br conc (mg/l)	44 cm Q3 (l/min)	67 cm Br conc (mg/l)	67 cm Q4 (l/min)
70		7 59687		0 68384		0 2591		0 38561
71		7 48683		0 68384		0 19224	25 3	0 38561
72		7 48683		0 68384		0 20224		0 37561
73		7 48683		0 68384	26 2	0 2691		0 38561
74		7 37715		0 75282		0 19224	26 4	0 38561
75		7 38715		0 75282		0 19224		0 37561
76	39 4	7 16884		0 68384		0 19224		0 37561
77		7 05023		0 69384		0 19224		0 37561
78		7 26782	40 6	0 69384		0 2591		0 37561
79		7 37715		0 68384		0 19224		0 45177
80		7 48683		0 68384		0 19224		0 37561
81		7 48683		0 75282		0 19224		0 37561
82		7 37715		0 75282		0 20224		0 37561
83		7 37715		0 68384	29 6	0 20224		0 38561
84		7 26782		0 68384		0 19224	30 7	0 38561
85		7 27782		0 68384		0 19224		0 37561
86	40 6	7 49683		0 68384		0 19224		0 45177
87		7 48683		0 69384		0 2591		0 37561
88		7 37715	40 5	0 69384		0 19224		0 37561
89		7 37715		0 68384		0 19224		0 45177
90		7 48683		0 68384		0 19224		0 45177
91		7 48683		0 68384		0 19224		0 37561
92		7 48683		0 68384		0 2691		0 37561
93		7 70725		0 75282	29 9	0 20224		0 46177
94		7 59687		0 75282		0 19224	31 4	0 38561
95		7 49683		0 68384		0 19224		0 37561
96	40 7	7 60687		0 68384		0 19224		0 37561
97		7 59687		0 69384		0 19224		0 37561
98		7 59687	40 1	0 69384		0 19224		0 45177
99		7 59687		0 68384		0 2591		0 45177
100		7 48683		0 68384		0 19224		0 37561
101		7 05023		0 68384		0 19224		0 37561
102		5 98447		0 68384		0 20224		0 45177
103		4 65904		0 54587	29 5	0 20224		0 38561
104		3 69159		0 4079		0 19224	30 5	0 38561
105		3 05505		0 26993		0 19224		0 37561
106	40 5	2 43708		0 14197		0 19224		0 37561
107		2 00531	35 5	0 14197		0 12538		0 37561
108		1 67965		0 06298		0 20224		0 37561
109		1 41714		0	25 8	0 20224		0 37561
110		1 23025		0 06298		0 12538		0 29945
111	39	0 96774		0 06298		0 12538		0 29945
112		0 89211				0 12538		0 29945
113		0 82648				0 13538		0 30945
114		0 70522			25	0 13538	27 5	0 30945
115	38 5	0 57397				0 12538		0 22329
116		0 56397				0 12538		0 22329
117		0 50834				0 13538		0 29945
118	38 5	0 37708			28 1	0 13538		0 22329
119		0 36708				0 12538		0 22329
120		0 37708				0 13538		0 22329
121	37 7	0 31145			26 6	0 06852		0 14713
122		0 30145				0 05852		0 22329
123		0 31145				0 12538		0 23329
124	37 8	0 18019				0 12538	23 5	0 15713
125		0 17019				0 13538		0 14713
126		0 24582			26 7	0 06852		0 22329
127	36 2	0 18019				0 05852		0 22329
128		0 10456				0 12538		0 14713
129		0 10456				0 13538		0 14713
130		0 11456			26 5	0 06852		0 22329
131	36 9	0 11456				0 05852		0 22329
132		0 10456				0 13538		0 14713
133		0 03894			26 3	0 13538		0 15713
134		0 03894				0 05852	20 6	0 15713
135		0 10456				0 05852		0 14713
136		0 04894				0 12538		0 14713
137	36 4	0 04894				0 06852		0 14713
138		0 03894			25 6	0 06852		0 14713

Table 5 (con t)
Simulation 4 (bromide application)

Time (min)	14 cm Br conc (mg/l)	14 cm Q1 (l/min)	26 cm Br conc (mg/l)	26 cm Q2 (l/min)	44 cm Br conc (mg/l)	44 cm Q3 (l/min)	67 cm Br conc (mg/l)	67 cm Q4 (l/min)
							--	--
139		0 03894				0 05852		0 14713
140		0 03894				0 05852		0 14713
141		0				0 12538		0 14713
142		0 03894				0 05852		0 14713
143		0 03894				0 06852		0 15713
144		0			25 5	0 13538	19 4	0 15713
145		0 03894				0 05852		0 14713
146		0 03894				0 05852		0 14713
147		0				0 05852		0 07097
148		0				0 05852		0 07097
149		0 03894				0 05852		0 14713
150		0 03894				0 05852		0 14713
151		0				0 05852		0 14713
152		0				0 05852		0 14713
153		0				0 12538		0 07097
154		0				0 05852		0 07097
155		0 03894				0 05852		0 14713
156		0 03894				0 05852		0 14713
157		0				0 05852		0 14713
158		0				0 05852		0 07097
159		0				0 05852		0 07097
160		0				0 05852		0 14713
161		0				0 05852		0 14713
162		0				0 05852		0 07097
163		0				0		0 07097
164		0				0 05852		0 14713
165		0				0 05852		0 14713
166		0				0 05852		0 07097
167		0				0 05852		0 07097
168		0 03894				0 05852		0 14713
169		0 03894				0 05852		0 07097
170						0		0 07097
171						0 05852		0 14713
172						0 05852		0 07097
173						0 05852		0 07097
174						0 05852		0 14713
175						0		0 07097
176						0 05852		0 07097
177						0 05852		0 07097
178						0		0 07097
179						0 05852		0 14713
180						0 05852		0 07097
181						0		0 07097
182						0 05852		0 07097
183						0 05852		0 07097
184						0		0 14713
185						0 05852		0 07097
186						0 05852		0 07097
187						0		0 07097
188						0 05952		0 07097
189						0 05852		0 07097
190						0		0 07097
191						0		0 14713
192						0 05852		0 07097
193						0 05852		0 07097
194						0		0 07097
195						0		0 07097
196						0 05852		0 07097
197						0 05852		0 07097
198						0		0 07097
199						0		0 07097
200						0 05852		0 07097
201						0 05852		0 07097
202						0		0 14713
203						0		0 07097
204						0 05852		0 07097
205						0 05852		0 07097
206						0		0 07097
207						0		0 07097

Table 5 (con t)
Simulation 4 (bromide application)

Time (min)	14 cm Br conc (mg/l)	14 cm Q1 (l/min)	26 cm Br conc (mg/l)	26 cm Q2 (l/min)	44 cm Br conc (mg/l)	44 cm Q3 (l/min)	67 cm Br conc (mg/l)	67 cm Q4 (l/min)
208						0		0 07097
209						0		0 07097
210						0 05852		0 07097
211						0 05852		0 07097
212						0		0 07097
213						0		0 07097
214						0		0 07097
215						0		0 07097
216						0		0 07097
217						0 05852		0 22329
225						0 05852		0 37561
230						0 05852		0 37561
235						0 05852		0 29945
240						0 05852		0 29945
245						0 05852		0 29945
250						0 05852		0 29945
255						0 05852		0 29945
260						0		0 37561
265						0 05852		0 37561
270						0 05852		0 29945
275						0		0 22329
280						0		0 22329
285						0 05852		0 29945
290						0 05852		0 29945
295						0		0 29945
300						0		0 29945
305						0		0 29945
310						0		0 22329
315						0		0 22329
320						0		0 29945
325						0		0 29945
330						0		0 22329
335						0		0 22329
340						0		0 29945
345						0		0 22329
350						0		0 22329
355						0		0 29945
360						0		0 22329
365						0		0 22329
370						0		0 22329
375						0 05852		0 22329
380						0 05852		0 22329

Table 5 (con t)
Simulation 5 (non bromide application)

Time (min)	14 cm Br conc (mg/l)	14 cm Q1 (l/min)	26 cm Br conc (mg/l)	26 cm Q2 (l/min)	44 cm Br conc (mg/l)	44 cm Q3 (l/min)	67 cm Br conc (mg/l)	67 cm Q4 (l/min)
0		0		0		0		0
1		0		0		0		0
2		0		0		0		0
3		0		0		0		0
4		0		0		0		0
5		0		0		0		0
6		0		0		0		0
7		0		0		0		0
8		0		0		0		0
9		0		0		0		0
10		0		0		0		0
11		0		0		0		0
12		0 01		0		0		0
13	3 73	0 24582		0		0		0
14		0 56397		0 01		0		0
15		0 69522	1 48	0 07298		0		0
16		0 82648		0 13197		0		0
17		1 08899		0 20095		0		0
18		1 42714		0 26993		0		0
19	1 18	1 68965		0 33892		0		0
20		1 87654		0 48689		0 01		0
21		2 00531	0 99	0 55587	1 31	0 01		0
22		2 17192		0 54587		0		0 01
23		2 25629		0 61485		0 05852	1 03	0 01
24		2 43708		0 61485		0 12538		0
25	0 86	2 61052		0 61485		0 12538		0 14713
26		2 6882		0 69384		0 13538		0 22329
27		2 86542	0 75	0 62485	0 94	0 13538		0 14713
28		3 04505		0 61485		0 12538		0 23329
29		3 31883		0 75282		0 12538	0 89	0 23329
30		3 50413		0 75282		0 12538		0 22329
31		3 5976		0 68384		0 19224		0 29945
32		3 7961		0 68384		0 20224		0 22329
33	0 63	3 98666		0 75282	0 82	0 13538		0 22329
34		4 26624		0 76282		0 19224		0 30945
35		4 4617	0 59	0 69384		0 19224	0 79	0 30945
36		4 56014		0 75282		0 19224		0 29945
37		4 75839		0 75282		0 19224		0 29945
38		4 8582		0 75282		0 19224		0 29945
39		4 95845		0 75282		0 19224		0 29945
40		5 16028		0 75282		0 20224		0 29945
41		5 26184		0 75282	0 72	0 20224		0 29945
42		5 37383		0 75282		0 19224		0 30945
43	0 46	5 37383		0 75282		0 19224	0 65	0 30945
44		5 36383		0 69384		0 19224		0 29945
45		5 46624	0 46	0 76282		0 2591		0 37561
46		5 46624		0 75282		0 19224		0 37561
47		5 46624		0 75282		0 19224		0 29945
48		5 36383		0 75282		0 19224		0 29945
49		5 46624		0 75282		0 19224		0 29945
50		5 56907		0 75282		0 20224		0 37561
51		5 56907		0 75282	0 63	0 20224		0 37561
52		5 68231		0 75282		0 2591		0 30945
53	0 38	5 68231		0 75282		0 19224	0 45	0 30945
54		5 67231		0 8318		0 19224		0 37561
55		5 67231	0 37	0 76282		0 2591		0 37561
56		5 67231		0 75282		0 19224		0 29945
57		5 56907		0 75282		0 19224		0 37561
58		5 56907		0 75282		0 19224		0 37561
59		5 67231		0 8218		0 19224		0 29945
60		5 67231		0 75282		0 2691		0 29945
61		5 67231		0 75282	0 55	0 20224		0 37561
62		5 68231		0 75282		0 19224		0 38561
63	0 31	5 78596		0 75282		0 2591	0 47	0 30945
64		5 77596		0 8318		0 2591		0 37561
65		5 67231	0 31	0 76282		0 19224		0 37561
66		5 67231		0 75282		0 19224		0 29945
67		5 77596		0 8218		0 2591		0 37561
68		5 88002		0 75282		0 19224		0 37561
69		5 98447		0 75282		0 19224		0 29945

Table 5 (con t)
Simulation 5 (non bromide application)

Time (min)	14 cm Br conc (mg/l)	14 cm Q1 (l/min)	26 cm Br conc (mg/l)	26 cm Q2 (l/min)	44 cm Br conc (mg/l)	44 cm Q3 (l/min)	67 cm Br conc (mg/l)	67 cm Q4 (l/min)
70		6 08933		0 8218		0 2691		0 37561
71		5 98447		0 75282	0 29	0 20224		0 37561
72		5 88002		0 75282		0 19224		0 38561
73		5 98447		0 75282		0 2591	0 4	0 38561
74		6 08933		0 75282		0 2591		0 29945
75		6 19457		0 75282		0 19224		0 37561
76		6 08933		0 75282		0 19224		0 37561
77		5 99447		0 8218		0 2591		0 37561
78	0 26	6 09933		0 75282		0 19224		0 37561
79		6 08933		0 75282		0 19224		0 37561
80		6 08933		0 75282		0 2591		0 37561
81		6 19457		0 75282		0 2591		0 37561
82		6 19457		0 76282		0 19224		0 37561
83		6 08933	0 23	0 76282		0 19224		0 37561
84		6 08933		0 75282		0 2591		0 37561
85		6 08933		0 75282		0 2691		0 37561
86		6 08933		0 8218	0 43	0 20224		0 37561
87		6 09933		0 75282		0 19224		0 30945
88	0 22	5 99447		0 68384		0 2591	0 35	0 38561
89		5 98447		0 75282		0 19224		0 37561
90		5 98447		0 75282		0 19224		0 37561
91		5 98447		0 75282		0 2591		0 37561
92		5 98447		0 76282		0 2591		0 37561
93		5 98447	0 21	0 76282		0 2591		0 37561
94		5 88002		0 75282		0 19224		0 37561
95		5 36383		0 68384		0 20224		0 45177
96		4 4617		0 61485	0 39	0 2691		0 37561
97		3 51413		0 54587		0 19224		0 38561
98	0 22	2 7865		0 4179		0 19224	0 31	0 38561
99		2 34135	0 22	0 21095		0 19224		0 29945
100		1 94217		0 06298		0 19224		0 37561
101		1 61402		0 06298		0 2591		0 37561
102		1 42714		0 06298		0 20224		0 37561
103	0 25	1 16462			0 41	0 13538		0 38561
104		0 95774				0 19224	0 31	0 30945
105		0 89211				0 19224		0 29945
106		0 76085				0 12538		0 29945
107		0 62959				0 12538		0 29945
108		0 63959				0 13538		0 29945
109	0 3	0 57397			0 39	0 13538		0 29945
110		0 43271				0 12538		0 29945
111		0 36708				0 12538		0 23329
112		0 30145				0 12538	0 37	0 23329
113		0 30145				0 05852		0 22329
114		0 31145				0 05852		0 22329
115	0 33	0 18019				0 13538		0 22329
116		0 17019			0 4	0 13538		0 22329
117		0 17019				0 12538		0 23329
118		0 17019				0 12538	0 47	0 23329
119		0 17019				0 05852		0 22329
120		0 10456				0 05852		0 22329
121		0 11456				0 12538		0 23329
122	0 37	0 11456				0 13538	0 39	0 15713
123		0 10456			0 42	0 06852		0 22329
124		0 03894				0 05852		0 22329
125		0 03894				0 13538		0 14713
126		0 10456			0 42	0 13538		0 22329
127		0 03894				0 05852		0 22329
128		0 04894				0 05852		0 14713
129	0 41	0 04894				0 05852		0 14713
130		0 03894				0 05852		0 15713
131		0 03894				0 12538	0 4	0 15713
132		0				0 05852		0 22329
133		0 03894				0 05852		0 22329
134		0 03894				0 12538		0 14713
135		0				0 05852		0 14713
136		0 03894				0 05852		0 14713
137		0 03894				0 05852		0 14713
138		0				0 05852		0 14713

Table 5 (con t)
Simulation 5 (non bromide application)

Time (min)	14 cm Br conc (mg/l)	14 cm Q1 (l/min)	26 cm Br conc (mg/l)	26 cm Q2 (l/min)	44 cm Br conc (mg/l)	44 cm Q3 (l/min)	67 cm Br conc (mg/l)	67 cm Q4 (l/min)
139		0				0 05852		0 14713
140		0				0 05852		0 14713
141		0 03894				0 12538		0 14713
142		0 03894				0 19224		0 68025
178		0				0 2591		1 1372
188		0 03894				0 2591		1 06105
198		0 03894				0 19224		0 98489
208						0 05852		0 90873

Table 5 (con t)
Simulation 7 (bromide application)

Time (min)	14 cm Br conc (mg/l)	14 cm Q1 (l/min)	26 cm Br conc (mg/l)	26 cm Q2 (l/min)	44 cm Br conc (mg/l)	44 cm Q3 (l/min)	67 cm Br conc (mg/l)	67 cm Q4 (l/min)
0		0		0		0	2 6	0
1		0		0		0		0
2		0		0		0		0
3		0		0		0		0
4		0		0		0		0
5		0		0		0		0
6		0		0		0		0 07097
7		0		0		0		0 07097
8		0		0		0		0
9		0		0		0		0
10		0		0		0		0
11	0 93	0 03894		0		0		0
12		0 17019		0		0		0
13		0 36708	8 8	0		0		0
14	11 5	0 56397		0 13197		0		0 07097
15		0 69522		0 20095		0		0 07097
16		0 82648	12 9	0 13197		0		0
17	16 3	0 89211		0 13197		0		0
18		0 95774		0 20095		0		0 0125
19		1 08899	16	0 20095		0	2 6	0 0125
20	18 2	1 22025		0 20095		0 0125		0
21		1 28588		0 26993	8 2	0 02922		0
22		1 41714	18 8	0 20095		0 01672		0 07097
23	20 4	1 48277		0 20095		0 02922		0 14713
24		1 48277		0 26993	11 3	0 02922		0 14713
25		1 5484	20 7	0 33892		0 01672		0 14713
26	22 5	1 61402		0 33892		0 02922		0 14713
27		1 61402		0 26993	14 5	0 02922		0 15963
28		1 61402	22 6	0 26993		0 02926	9 2	0 15963
29		1 67965		0 33892		0 04176		0 22329
30		1 67965		0 33892	16 1	0 04176		0 22329
31	25 2	1 67965		0 26993		0 02926		0 22329
32		1 74528		0 33892		0 05151		0 23579
33		1 74528	25 7	0 33892	16 9	0 05151	12 6	0 23579
34		1 74528		0 33892		0 03901		0 29945
35		1 81091		0 33892		0 05151		0 22329
36	26 4	1 81091		0 26993	19 5	0 05151		0 22329
37		1 81091		0 33892		0 03901		0 38811
38		1 87654	27 2	0 33892		0 03901	16 4	0 38811
39		1 94217		0 33892		0 03901		0 29945
40		1 94217		0 33892		0 05151		0 29945
41	28 2	2 00531		0 33892	19 3	0 07102		0 37561
42		2 08825		0 33892		0 05852		0 38811
43		2 17192	27 4	0 33892		0 05852	19 1	0 31195
44		2 25629		0 33892		0 05852		0 37561
45		2 25629		0 33892		0 07102		0 37561
46	27 8	2 25629		0 33892	21	0 07102		0 37561
47		2 25629		0 33892		0 05852		0 38811
48		2 34135	30	0 33892		0 05852	19 9	0 38811
49		2 42708		0 26993		0 05852		0 45177
50		2 51348		0 33892		0 13788		0 37561
51	30 4	2 51348		0 33892	23 5	0 13788		0 37561
52		2 51348		0 26993		0 12538		0 38811
53		2 6882	30 5	0 26993		0 12538	22 1	0 38811
54		2 6882		0 26993		0 12538		0 45177
55		2 6882		0 26993		0 07102		0 45177
56	33	2 7765		0 26993	20 7	0 07102		0 37561
57		2 7765		0 26993		0 12538		0 38811
58		2 7765	32	0 26993		0 05852	24 6	0 46427
59		2 7765		0 26993		0 05852		0 45177
60		2 7765		0 26993		0 13788		0 45177
61		2 86542		0 26993	21 1	0 13788		0 45177
62		2 86542		0 26993		0 05852		0 45177
63		2 86542		0 26993		0 05852		0 52793
64		2 86542		0 26993		0 12538		0 52793
65		2 86542		0 26993		0 13788		0 45177
66	32 9	2 95494		0 26993	19	0 07102		0 45177
67		2 95494		0 26993		0 05852		0 46427
68		2 86542	31 9	0 26993		0 12538	25 7	0 46427
69		2 86542		0 26993		0 12538		0 45177

Table 5 (con t)
Simulation 7 (bromide application)

Time (min)	14 cm Br conc (mg/l)	14 cm Q1 (l/min)	26 cm Br conc (mg/l)	26 cm Q2 (l/min)	44 cm Br conc (mg/l)	44 cm Q3 (l/min)	67 cm Br conc (mg/l)	67 cm Q4 (l/min)
--			--					
70		2 95494		0 26993		0 05852		0 45177
71		2 95494		0 26993		0 05852		0 45177
72		2 95494		0 26993		0 12538		0 52793
73		2 95494		0 26993		0 12538		0 52793
74		2 86542		0 26993		0 12538		0 45177
75		2 86542		0 26993		0 13788		0 45177
76	33 1	2 95494		0 26993	20 2	0 07102		0 45177
77		2 95494		0 26993		0 05852		0 54043
78		2 86542	34 9	0 26993		0 12538	28 2	0 54043
79		2 86542		0 20095		0 12538		0 52793
80		2 95494		0 20095		0 12538		0 52793
81		2 95494		0 26993		0 12538		0 52793
82		2 95494		0 26993		0 12538		0 60409
83		3 04505		0 26993		0 12538		0 52793
84		3 04505		0 33892		0 05852		0 52793
85		2 95494		0 33892		0 07102		0 52793
86	35 5	2 95494		0 26993	28 9	0 13788		0 52793
87		2 95494		0 20095		0 12538		0 61659
88		2 95494	33 6	0 20095		0 12538	28 2	0 54043
89		2 95494		0 26993		0 12538		0 52793
90		2 95494		0 26993		0 12538		0 52793
91		3 04505		0 26993		0 12538		0 52793
92		3 04505		0 26993		0 12538		0 60409
93		2 95494		0 26993		0 12538		0 52793
94		2 95494		0 33892		0 05852		0 52793
95		2 95494		0 33892		0 07102		0 60409
96	34 2	2 95494		0 26993	29 9	0 13788		0 52793
97		2 95494		0 26993		0 12538		0 54043
98		2 95494	34 6	0 26993		0 12538	29 2	0 54043
99		2 95494		0 26993		0 12538		0 52793
100		3 04505		0 26993		0 12538		0 52793
101		3 04505		0 26993		0 12538		0 52793
102		2 95494		0 26993		0 12538		0 52793
103		2 95494		0 26993		0 12538		0 52793
104		3 04505		0 26993		0 12538		0 52793
105		3 04505		0 26993		0 07102		0 45177
106	34 6	2 7765		0 26993	27 5	0 07102		0 52793
107		2 42708		0 26993		0 12538		0 52793
108		2 08825	34 5	0 33892		0 12538		0 46427
109		1 87654		0 33892		0 12538	27 6	0 46427
110	33 9	1 61402		0 20095		0 13788		0 37561
111		1 41714		0 13197	22 3	0 07102		0 29945
112		1 28588	34	0 13197		0 05852		0 37561
113	34 6	1 08899		0 06298		0 13788		0 37561
114		0 95774	33	0	19	0 07102		0 31195
115		0 82648		0 06298		0 05852	26 2	0 31195
116		0 69522		0 06296		0 07102		0 22329
117	33 7	0 62959			18 7	0 07102		0 23579
118		0 62959				0 05852	23 8	0 31195
119		0 56397				0 07102		0 22329
120	32 85	0 43271			18 5	0 07102		0 22329
121		0 36708				0 05852		0 23579
122		0 36708				0 07102	22 1	0 15963
123	34 2	0 36708			19 2	0 0125		0 14713
124		0 30145				0 05852		0 22329
125		0 30145				0 05852		0 22329
126	32 6	0 30145				0 07102		0 14713
127		0 17019			17 9	0 13788	20 5	0 15963
128		0 17019				0 05852		0 14713
129		0 23582				0		0 22329
130	32 2	0 17019				0 07102		0 22329
131		0 17019				0 07102		0 14713
132		0 17019				0		0 14713
133		0 17019				0 05852		0 14713
134		0 17019				0 05852		0 14713
135	31 3	0 10456				0		0 14713
136		0 10456				0 05852		0 14713
137		0 10456				0 05852		0 14713
138		0 10456				0		0 14713

Table 5 (con t)
Simulation 7 (bromide application)

Time (min)	14 cm Br conc (mg/l)	14 cm Q1 (l/min)	26 cm Br conc (mg/l)	26 cm Q2 (l/min)	44 cm Br conc (mg/l)	44 cm Q3 (l/min)	67 cm Br conc (mg/l)	67 cm Q4 (l/min)
139		0 10456				0 05852		0 14713
140		0 03894				0 05852		0 14713
141		0 03894				0		0 14713
142		0 10456				0 05852		0 14713
143		0 10456				0 05852		0 07097
144		0 03894				0		0 07097
145		0 03894				0 05852		0 14713
146		0 10456				0 05852		0 14713
147		0 03894				0		0 14713
148		0 03894				0		0 14713
149		0 03894				0 05852		0 14713
150		0 03894				0 05852		0 14713
151		0 03894				0		0 07097
152		0 03894				0		0 07097
153		0 03894				0 05852		0 14713
154		0 03894				0 05852		0 14713
155		0 03894				0		0 14713
156		0				0		0 07097
157		0 03894				0		0 07097
158		0 03894				0 05852		0 14713
159		0				0 05852		0 14713
160		0 03894				0		0 07097
161		0 03894				0		0 07097
162		0				0		0 14713
163		0				0 05852		0 14713
164		0 03894				0 05852		0 07097
165		0 03894				0		0 07097
166		0				0		0 14713
167		0				0		0 07097
168		0				0		0 07097
169		0				0 05852		0 14713
170		0 03894				0 05852		0 14713
171		0 03894				0		0 07097
172		0				0		0 07097
173		0				0		0 14713
174		0				0		0 07097
175		0				0 05852		0 08347
176		0				0 05852	14 9	0 08347
177		0				0		0 07097
178		0 03894				0		0 14713
179		0 03894				0 05852		0 60409
189		0				0 12538		0 90873
199		0 03894				0 12538		0 83257
209		0 03894				0 12538		0 83257
219						0 05852		0 75641
229						0		0 75641
239						0 05852		0 68025
249						0 05852		0 68025
259								0 68025
								0 07097

Table 5 (con t)
Simulation 8 (non bromide application)

Time (min)	14 cm Br conc (mg/l)	14 cm Q1 (l/min)	26 cm Br conc (mg/l)	26 cm Q2 (l/min)	44 cm Br conc (mg/l)	44 cm Q3 (l/min)	67 cm Br conc (mg/l)	67 cm Q4 (l/min)
0		0		0		0		0
1		0		0		0		0
2		0		0		0		0
3		0		0		0		0
4		0		0		0		0
5		0		0		0		0
6		0		0		0		0
7		0		0		0		0
8		0		0		0		0
9		0		0		0		0
10		0		0		0		0
11		0		0		0		0
12		0		0		0		0
13		0		0		0		0
14		0		0		0		0
15		0		0		0		0
16		0		0		0		0
17		0		0		0		0
18		0 01		0		0		0
19	3 29	0 18019		0		0		0
20		0 43271		0 01		0		0
21		0 56397	2 19	0 01		0		0
22		0 69522		0		0		0
23		0 82648		0 06298		0		0
24		0 96774		0 13197		0 01		0
25	1 26	1 09899		0 20095	1 51	0 01		0
26		1 15462		0 27993		0		0 07097
27		1 15462	1 51	0 21095		0		0 07097
28		1 22025		0 20095		0		0
29		1 28588		0 33892		0		0
30		1 29588		0 33892		0 06852		0 01
31	0 92	1 29588		0 26993	0 99	0 06852	0 46	0 01
32		1 35151		0 34892		0 05852		0
33		1 41714	1 11	0 34892		0 05852		0
34		1 41714		0 33892		0 05852		0
35		1 41714		0 4079		0 12538		0 07097
36		1 48277		0 4079		0 06852		0 15713
37		1 5484		0 4079	0 88	0 06852	1	0 15713
38		1 62402		0 47689		0 12538		0 14713
39	0 74	1 62402		0 47689		0 12538		0 14713
40		1 61402		0 48689		0 05852		0 14713
41		1 74528	0 84	0 55587		0 05852		0 22329
42		1 74528		0 54587		0 12538		0 23329
43		1 74528		0 54587		0 12538	0 93	0 15713
44		1 81091		0 47689		0 13538		0 22329
45		1 81091		0 47689	0 69	0 13538		0 29945
46		1 87654		0 54587		0 05852		0 22329
47		1 87654		0 47689		0 05852		0 22329
48		1 88654		0 47689		0 12538		0 29945
49	0 57	2 01531		0 47689		0 12538		0 29945
50		2 00531		0 4179		0 12538		0 30945
51		2 00531	0 82	0 4179		0 12538	0 75	0 30945
52		2 17192		0 4079		0 19224		0 37561
53		2 17192		0 4079		0 19224		0 52793
54		2 17192		0 33892		0 13538		0 52793
55		2 17192		0 33892	0 62	0 13538		0 45177
56		2 17192		0 33892		0 12538		0 45177
57		2 25629		0 26993		0 12538		0 45177
58		2 26629		0 33892		0 19224		0 45177
59	0 47	2 35135		0 33892		0 19224		0 45177
60		2 34135		0 34892		0 12538		0 46177
61		2 25629	0 69	0 34892		0 12538	0 58	0 46177
62		2 34135		0 26993		0 19224		0 45177
63		2 42708		0 26993		0 19224		0 52793
64		2 34135		0 26993		0 13538		0 52793
65		2 34135		0 26993	0 53	0 13538		0 45177
66		2 42708		0 26993		0 19224		0 52793
67		2 42708		0 26993		0 19224		0 52793
68		2 42708		0 26993		0 12538		0 52793
69		2 42708		0 33892		0 12538		0 52793

Table 5 (con t)
Simulation 8 (non bromide application)

Time (min)	14 cm Br conc (mg/l)	14 cm Q1 (l/min)	26 cm Br conc (mg/l)	26 cm Q2 (l/min)	44 cm Br conc (mg/l)	44 cm Q3 (l/min)	67 cm Br conc (mg/l)	67 cm Q4 (l/min)
70		2 42708		0 33892		0 12538		0 46177
71		2 42708		0 26993		0 19224	0 49	0 53793
72		2 42708		0 26993		0 19224		0 52793
73		2 43708		0 26993		0 12538		0 45177
74	0 37	2 43708		0 26993		0 12538		0 52793
75		2 42708		0 27993		0 19224		0 52793
76		2 51348	0 52	0 27993		0 19224		0 45177
77		2 51348		0 26993		0 12538		0 52793
78		2 51348		0 26993		0 19224		0 52793
79		2 51348		0 26993		0 20224		0 52793
80		2 51348		0 26993	0 45	0 13538		0 52793
81		2 60052		0 33892		0 12538		0 52793
82		2 51348		0 33892		0 19224		0 60409
83		2 51348		0 26993		0 19224		0 52793
84		2 60052		0 26993		0 19224		0 52793
85		2 60052		0 26993		0 19224		0 53793
86		2 60052		0 26993		0 12538	0 39	0 53793
87		2 60052		0 26993		0 19224		0 52793
88		2 60052		0 26993		0 19224		0 45177
89		2 51348		0 26993		0 12538		0 52793
90		2 51348		0 26993		0 12538		0 52793
91		2 60052		0 26993		0 19224		0 45177
92		2 60052		0 26993		0 19224		0 52793
93		2 61052		0 26993		0 12538		0 52793
94	0 31	2 61052		0 26993		0 19224		0 52793
95		2 60052		0 27993		0 19224		0 53793
96		2 60052	0 29	0 27993		0 12538	0 39	0 53793
97		2 60052		0 26993		0 19224		0 52793
98		2 60052		0 26993		0 19224		0 52793
99		2 60052		0 26993		0 13538		0 52793
100		2 60052		0 26993	0 36	0 20224		0 52793
101		2 60052		0 26993		0 19224		0 52793
102		2 6882		0 26993		0 12538		0 52793
103		2 6882		0 26993		0 19224		0 52793
104		2 60052		0 26993		0 19224		0 52793
105		2 6882		0 27993		0 19224		0 61409
106		2 6882	0 27	0 27993		0 19224	0 32	0 53793
107		2 60052		0 26993		0 12538		0 52793
108		2 60052		0 26993		0 19224		0 52793
109		2 6882		0 26993		0 20224		0 60409
110		2 6882		0 26993	0 2	0 13538		0 60409
111		2 51348		0 26993		0 19224		0 52793
112		2 51348		0 26993		0 19224		0 60409
113		2 61052		0 26993		0 12538		0 52793
114	0 26	2 61052		0 26993		0 19224		0 52793
115		2 60052		0 27993		0 19224		0 53793
116		2 51348	0 23	0 27993		0 12538	0 28	0 53793
117		2 34135		0 33892		0 19224		0 52793
118		2 00531		0 33892		0 19224		0 45177
119		1 67965		0 27993		0 13538		0 45177
120		1 49277	0 25	0 21095	0 4	0 13538		0 45177
121	0 26	1 29588		0 13197		0 12538		0 38561
122		1 08899		0 13197		0 19224	0 32	0 30945
123		1 02337		0 06298		0 20224		0 29945
124		0 90211		0 06298	0 41	0 13538		0 29945
125	0 29	0 77085		0 07298		0 12538		0 29945
126		0 69522	0 28	0 01		0 12538		0 22329
127		0 62959		0		0 05852		0 22329
128		0 56397		0		0 05852		0 22329
129		0 43271		0 06298		0 12538		0 23329
130		0 36708		0 06298		0 12538	0 36	0 23329
131		0 36708				0 13538		0 14713
132		0 37708			0 42	0 13538		0 22329
133	0 38	0 31145				0 12538		0 22329
134		0 23582				0 12538		0 14713
135		0 17019				0 05852		0 22329
136		0 17019				0 05852		0 22329
137		0 17019				0 12538		0 14713
138		0 17019				0 13538		0 14713

Table 5 (con t)
Simulation 8 (non bromide application)

Time (min)	14 cm Br conc (mg/l)	14 cm Q1 (l/min)	26 cm Br conc (mg/l)	26 cm Q2 (l/min)	44 cm Br conc (mg/l)	44 cm Q3 (l/min)	67 cm Br conc (mg/l)	67 cm Q4 (l/min)
-								
139		0 17019			0 42	0 06852		0 14713
140		0 11456				0 05852		0 14713
141	0 4	0 04894				0 12538		0 23329
142		0 03894				0 12538	0 37	0 23329
143		0 10456				0 05852		0 14713
144		0 10456				0 05852		0 14713
145		0 03894				0 12538		0 07097
146		0 04894				0 05852		0 07097
147	0 41	0 04894				0 05852		0 14713
148		0 03894				0 12538		0 07097
149		0 03894				0 12538		0
150		0				0 05852		0
151		0 03894				0 05852		0
152		0 03894				0 05852		0 07097
153		0				0 05852		0 14713
154		0 03894				0 05852		0 07097
155		0 03894				0 05852		0 07097
156		0				0 12538		0 14713
157		0				0 05852		0 14713
158		0 03894				0 05852		0 14713
159		0 03894				0 05852		0 07097
160		0				0 05852		0 07097
161		0				0 05852		0 14713
162		0				0 06852		0 14713
163		0			0 48	0 06852		0 08097
164		0 03894				0 2591	0 4	0 15713
175		0 03894				0 45969		0 52793
185		0 03894				0 32597		0 75641
195		0 03894				0 2591		0 83257
205						0 19224		0 83257
215						0 05852		0 75641
225						0 05852		0 75641
235						0 05852		0 68025

Table 5 (con t)
Simulation 9 (bromide application)

Time (min)	14 cm Br conc (mg/l)	14 cm Q1 (l/min)	26 cm Br conc (mg/l)	26 cm Q2 (l/min)	44 cm Br conc (mg/l)	44 cm Q3 (l/min)	67 cm Br conc (mg/l)	67 cm Q4 (l/min)
0		0		0		0		0
1		0		0		0		0
2		0		0		0		0
3		0		0		0		0
4		0		0		0		0
5		0		0		0		0
6		0		0		0		0
7		0		0		0		0
8		0		0		0		0
9		0		0		0		0
10		0		0		0		0
11		0		0		0		0
12		0		0		0		0
13		0		0		0		0
14		0		0		0		0
15		0		0		0		0
16		0		0		0		0
17		0		0		0		0
18		0		0		0		0
19		0		0		0		0
20		0		0		0		0
21		0		0		0		0
22		0		0		0		0
23		0		0		0		0
24		0		0		0		0
25		0		0		0		0
26		0		0		0		0
27		0		0		0		0
28		0		0		0		0
29		0		0		0		0
30		0		0		0		0
31		0		0		0		0
32		0		0		0		0
33		0		0		0		0
34		0		0		0		0
35		0		0		0		0
36		0		0		0		0
37		0		0		0		0
38		0		0		0		0
39		0		0		0		0
40		0		0		0		0
41		0		0		0		0
42		0		0		0		0
43		0		0		0		0
44		0		0		0		0
45		0		0		0		0
46		0		0		0		0
47		0		0		0		0
48		0		0		0		0
49		0		0		0		0
50		0		0		0		0
51		0		0		0		0
52		0		0		0		0
53		0		0		0		0
54		0		0		0		0
55	43 5	0 2		0		0		0
56		0		0		0		0
57		0		0		0		0
58		0		0		0		0
59		0		0		0		0
60		0		0		0		0
61		0 11164		0		0		0
62		0		0		0		0
63		0		0		0		0
64		0		0		0		0
65		0		0		0		0
66		0 11164		0		0		0
67		0		0		0		0
68		0		0		0		0
69		0 11164		0 01		0		0

Table 5 (con t)
Simulation 9 (bromide application)

Time (min)	14 cm Br conc (mg/l)	14 cm Q1 (l/min)	26 cm Br conc (mg/l)	26 cm Q2 (l/min)	44 cm Br conc (mg/l)	44 cm Q3 (l/min)	67 cm Br conc (mg/l)	67 cm Q4 (l/min)
70		0 01	41 2	0 01		0		0
71	45	0 12164		0		0		0
72		0		0		0		0
73		0 11164		0		0		0
74		0		0		0		0
75		0 11164		0		0		0
76		0		0		0		0 01
77		0 11164		0		0	41 9	0 01
78		0 11164		0		0		0
79		0		0		0		0
80		0 11164		0		0		0
81		0		0		0		0
82		0 11164		0		0		0
83		0 11164		0		0		0
84		0		0		0		0
85		0 11164		0		0		0
86		0 12164		0		0		0
87	45 2	0 12164		0 01		0		0
88		0	45 1	0 01		0		0
89		0 11164		0		0		0
90		0 11164		0		0		0
91		0 11164		0		0		0
92		0 11164		0		0		0 01
93		0		0		0	35 2	0 01
94		0 11164		0		0		0
95		0 11164		0		0 01		0
96		0 11164		0 13197	31 2	0 01		0
97		0 11164		0		0		0
98		0 11164		0		0		0 14713
99		0 11164		0		0		0
100		0 11164		0		0		0
101		0 11164		0		0		0 14713
102		0 11164		0		0		0
103		0 11164		0 01		0		0 14713
104		0 11164	37 9	0 01		0		0
105		0 23937		0		0		0 14713
106		0 11164		0		0		0
107		0 11164		0		0		0
108		0 11164		0		0		0 15713
109		0 12164		0		0	26 9	0 15713
110	45	0 24937		0		0		0
111		0 11164		0		0 01		0 14713
112		0 11164		0	37 1	0 01		0
113		0 11164		0		0		0 14713
114		0 11164		0		0		0 14713
115		0 23937		0		0		0 14713
116		0 11164		0		0		0
117		0 23937		0 13197		0		0 14713
118		0 11164		0		0		0 14713
119		0 23937		0		0		0 14713
120		0 11164		0		0		0 14713
121		0 11164		0		0		0 14713
122		0 11164		0		0		0 14713
123		0 23937		0		0		0 14713
124		0 23937		0		0 12538		0 14713
125		0 11164		0		0		0
126		0 23937		0 01		0		0 14713
127		0 23937	35 9	0 01		0 01		0 14713
128		0 11164		0	41	0 01		0 14713
129		0 23937		0		0		0 14713
130		0 23937		0		0		0 14713
131		0 23937		0		0 12538		0 15713
132		0 11164		0		0	28 3	0 15713
133		0 23937		0 13197		0		0 14713
134		0 23937		0		0		0 14713
135		0 23937		0		0		0 14713
136		0 23937		0		0		0 14713
137		0 23937		0		0 12538		0 14713
138		0 23937		0		0		0 14713

Table 5 (con t)
Simulation 9 (bromide application)

Time (min)	14 cm Br conc (mg/l)	14 cm Q1 (l/min)	26 cm Br conc (mg/l)	26 cm Q2 (l/min)	44 cm Br conc (mg/l)	44 cm Q3 (l/min)	67 cm Br conc (mg/l)	67 cm Q4 (l/min)
139		0 24937		0		0		0 14713
140	45 1	0 24937		0		0		0 14713
141		0 23937		0 01		0		0 14713
142		0 23937	37	0 01		0		0 14713
143		0 3671		0		0 12538		0 14713
144		0 23937		0		0		0
145		0 23937		0 13197		0		0 29945
146		0 23937		0		0		0 14713
147		0 23937		0		0		0 14713
148		0 3671		0		0 12538		0 14713
149		0 23937		0		0		0 14713
150		0 3671		0		0		0 14713
151		0 23937		0		0		0 14713
152		0 3671		0		0		0 14713
153		0 23937		0		0 12538		0 15713
154		0 3671		0		0 01	29 6	0 15713
155		0 23937		0	42 1	0 01		0 14713
156		0 3671		0		0		0 14713
157		0 23937		0 13197		0		0 29945
158		0 3671		0		0		0 14713
159		0 23937		0		0 12538		0 14713
160		0 3671		0		0		0 14713
161		0 3671		0		0		0 14713
162		0 3671		0		0		0 29945
163		0 23937		0		0		0 14713
164		0 3671		0		0 12538		0 14713
165		0 3671		0		0		0 14713
166		0 3671		0		0		0 14713
167		0 3671		0		0		0 29945
168		0 23937		0		0		0 14713
169		0 3671		0		0 12538		0 14713
170		0 3771		0 13197		0		0 14713
171	46 2	0 3771		0 01		0		0 14713
172		0 23937	36 2	0 01		0		0 29945
173		0 3671		0		0		0 14713
174		0 3671		0		0 12538		0 14713
175		0 3671		0		0		0 14713
176		0 3671		0		0		0 29945
177		0 3671		0		0		0 14713
178		0 49483		0		0		0 14713
179		0 3671		0		0 12538		0 14713
180		0 3671		0		0		0 14713
181		0 3671		0		0		0 29945
182		0 3671		0		0		0 14713
183		0 3671		0 13197		0 12538		0 15713
184		0 3671		0		0 01	32 9	0 30945
185		0 49483		0	30 2	0 01		0 14713
186		0 3671		0		0		0 14713
187		0 3671		0		0		0 14713
188		0 3671		0		0		0 29945
189		0 3671		0		0 12538		0 14713
190		0 3671		0		0		0 14713
191		0 49483		0		0		0 14713
192		0 3671		0		0		0 29945
193		0 49483		0		0 12538		0 14713
194		0 3671		0		0		0 14713
195		0 3671		0 13197		0		0 29945
196		0 49483		0		0		0 14713
197		0 3671		0		0		0 29945
198		0 49483		0		0 12538		0 14713
199		0 3671		0		0		0 14713
200		0 49483		0		0		0 29945
201		0 3671		0		0		0 14713
202		0 49483		0		0		0 29945
203		0 49483		0		0 12538		0 14713
204		0 3771		0		0		0 29945
205	46 8	0 50483		0 01		0		0 14713
206		0 49483	38 5	0 14197		0		0 29945
207		0 3671		0		0		0 14713

Table 5 (con t)
Simulation 9 (bromide application)

Time (min)	14 cm Br conc (mg/l)	14 cm Q1 (l/min)	26 cm Br conc (mg/l)	26 cm Q2 (l/min)	44 cm Br conc (mg/l)	44 cm Q3 (l/min)	67 cm Br conc (mg/l)	67 cm Q4 (l/min)
208		0 49483		0		0 12538		0 29945
209		0 49483		0		0		0 14713
210		0 3671		0		0		0 29945
211		0 49483		0		0		0 29945
212		0 3671		0		0 12538		0 14713
213		0 49483		0		0		0 29945
214		0 49483		0 13197		0		0 29945
215		0 49483		0		0		0 14713
216		0 3671		0		0		0 29945
217		0 49483		0		0 12538		0 29945
218		0 49483		0		0		0 14713
219		0 49483		0		0		0 29945
220		0 49483		0		0		0 30945
221		0 49483		0 13197		0 13538	34 2	0 30945
222		0 49483		0	29 5	0 01		0 14713
223		0 49483		0		0		0 29945
224		0 49483		0		0		0 29945
225		0 49483		0		0		0 29945
226		0 49483		0 13197		0 12538		0 29945
227		0 49483		0		0		0 29945
228		0 49483		0		0		0 29945
229		0 49483		0		0 12538		0 29945
230		0 49483		0		0		0 29945
231		0 49483		0 13197		0		0 29945
232		0 49483		0		0		0 14713
233		0 49483		0		0 12538		0 29945
234		0 49483		0		0		0 29945
235		0 49483		0 13197		0		0 29945
236		0 49483		0		0 12538		0 29945
237		0 49483		0		0		0 29945
238		0 50483		0		0		0 29945
239	45 5	0 63256		0 14197		0 12538		0 14713
240		0 49483	41 7	0 01		0		0 29945
241		0 49483		0		0		0 29945
242		0 49483		0		0 12538		0 29945
243		0 49483		0 13197		0		0 29945
244		0 49483		0		0		0 29945
245		0 62256		0		0 12538		0 29945
246		0 49483		0		0		0 29945
247		0 49483		0 13197		0		0 29945
248		0 49483		0		0 12538		0 29945
249		0 62256		0		0		0 29945
250		0 49483		0		0		0 29945
251		0 49483		0 13197		0 12538		0 14713
252		0 49483		0		0		0 29945
253		0 62256		0		0 01		0 30945
254		0 50483		0	27	0 13538	34 1	0 30945
255	46 8	0 50483		0 14197		0		0 29945
256		0 49483	41 7	0 01		0		0 29945
257		0 49483		0		0 12538		0 29945
258		0 62256		0 13197		0		0 29945
259		0 49483		0		0		0 29945
260		0 49483		0 01		0 12538		0 29945
261		0 63256	41 4	0 01		0		0 29945
262	46 3	0 50483		0 13197		0 13538		0 30945
263		0 3671		0	26 8	0 01	34 3	0 30945
264		0 49483		0 01		0		0 29945
265		0 3671	41 3	0 01		0 12538		0 14713
266		0 24937		0		0		0 29945
267	46	0 3771		0		0 01		0 30945
268		0 23937		0 13197	29 6	0 01	33 8	0 30945
269		0 23937		0 01		0 12538		0 29945
270		0 11164	40 2	0 01		0		0 14713
271		0 24937		0		0		0 29945
272	44 9	0 12164		0		0 13538		0 30945
273		0 11164		0	29 4	0 01	33 2	0 15713
274		0 11164		0 01		0		0 29945
275		0 11164	38 9	0 01		0		0 14713
276		0		0		0 12538		0 14/13

Table 5 (con t)
Simulation 9 (bromide application)

Time (min)	14 cm Br conc (mg/l)	14 cm Q1 (l/min)	26 cm Br conc (mg/l)	26 cm Q2 (l/min)	44 cm Br conc (mg/l)	44 cm Q3 (l/min)	67 cm Br conc (mg/l)	67 cm Q4 (l/min)
277		0 12164		0		0		0 29945
278	44 9	0 12164		0		0 01		0 14713
279		0		0	29 1	0 01		0 30945
280		0		0 01		0	30 2	0 15713
281		0	38 7	0 01		0 12538		0 14713
282		0 11164				0		0 29945
283		0				0		0 14713
284		0				0		0 14713
285		0				0		0 14713
286		0 01				0		0 14713
287	45 1	0 01				0 12538		0 29945
288		0				0 01		0 14713
289		0			25 8	0 01		0 15713
290		0 11164				0	27 2	0 15713
291		0				0		0 14713
292		0 01				0		0 14713
293	44 8	0 01				0		0 14713
294		0				0		0 14713
295						0		0 14713
296						0		0 14713
297						0		0 14713
298						0 13538		0 14713
299					23 4	0 01		0
300						0		0 14713
301								0 14713
302								0 14713
303								0 14713
304								0
305								0 14713
306								0 14713
307								0 14713
308								0 14713
309								0
310								0 14713
311								0 14713
312								0 14713
313								0
314								0 14713
315								0 14713
316								0
317								0 14713
318								0 14713
319								0
320								0 14713
321								0 14713
322								0
323								0 14713
324								0 14713
325								0
326								0 15713
327							19 7	0 15713
328								0
329								0 14713
330								0
331								0 14713
332								0
333								0 14713
334								0
335								0 14713
336								0 14713
337								0
338								0 14713
339								0 01
340							18 4	0 15713
341								0
342								0 14713
343								0
344								0 14713
345								0

Table 5 (con t)
Simulation 9 (bromide application)

Time (min)	14 cm Br conc (mg/l)	14 cm Q1 (l/min)	26 cm Br conc (mg/l)	26 cm Q2 (l/min)	44 cm Br conc (mg/l)	44 cm Q3 (l/min)	67 cm Br conc (mg/l)	67 cm Q4 (l/min)
346								0 14713
347								0
348								0 14713
349							17 5	0 01
364								0 01504
374								0 06041
384								0 06041
394								0 06041
404								0 06041
414								0 04518
424								0 06041
434								0 04518
444								0 04518
454								0 04518
464								0 02995
474								0 04518
484								0 02995
494								0 02995
504								0 01471
514								0 04518
524								0 01471
534								0 02995
544								0 01471
554								0 02995
564								0 01471
574								0 02995
584								0 01471
594								0 01471
604								0 01471
614								0 02995
624								0 01471
634								0 01471
644								0 01471
654								0 01471
664								0 01471
674								0 01471
684								0
694								0 01471
704								0 01471
714								0 01471
724								0
734								0 01471
744								0
754								0 01471
764								0 01471
774								0
784								0 01471

Table 5 (con t)
Simulation 10 (non bromide application)

Time (min)	14 cm Br conc (mg/l)	14 cm Q1 (l/min)	26 cm Br conc (mg/l)	26 cm Q2 (l/min)	44 cm Br conc (mg/l,	44 cm Q3 (l/min)	67 cm Br conc (mg/l)	67 cm Q4 (l/min)
1		0		0		0		0
2		0		0		0		0
3		0		0		0		0
4		0		0		0		0
5		0		0		0		0
6		0		0		0		0
7		0		0		0		0
8		0		0		0		0
9		0		0		0		0
10		0		0		0		0
11		0		0		0		0
12		0		0		0		0
13		0		0		0		0
14		0		0		0		0
15		0		0		0		0
16		0		0		0		0
17		0		0		0		0
18		0		0		0		0
19		0		0		0		0
20		0		0		0		0
21		0 11164		0		0		0
22		0 11164		0		0		0
23		0 11164		0		0		0
24		0 11164		0		0		0
25		0 23937		0		0		0
26		0 11164		0		0		0
27		0 23937		0		0		0
28		0 11164		0		0		0
29		0 23937		0		0		0
30		0 23937		0		0	14 8	0 02
31		0 23937		0		0		0 14713
32		0 23937		0		0		0
33		0 23937		0		0		0
34		0 3771		0		0		0
35	15 1	0 3771		0		0		0
36		0 3671		0		0		0
37		0 3671		0		0		0
38		0 49483		0 1319/		0		0 14713
39		0 3671		0	18 1	0 02		0
40		0 49483		0 13197		0		0
41		0 49483		0		0		0 14713
42		0 49483		0 13197		0		0
43		0 62256		0		0		0 14713
44		0 49483		0 13197		0		0 14713
45		0 49483		0		0		0 01
46		0 49483		0 14197		0	12 3	0 15713
47		0 62256	14 4	0 01		0 12538		0 14713
48		0 49483		0		0		0 14713
49		0 49483		0 13197		0		0
50		0 63256		0		0		0 14713
51	12 3	0 50483		0 13197		0		0 14713
52		0 62256		0		0		0 14713
53		0 49483		0 13197		0 12538		0 14713
54		0 62256		0		0 01		0 14713
55		0 62256		0 13197	14 3	0 01		0 14713
56		0 62256		0		0		0 14713
57		0 62256		0 13197		0		0 14713
58		0 62256		0 13197		0 12538		0 14713
59		0 62256		0		0		0 14713
60		0 62256		0 13197		0		0 14713
61		0 75029		0 14197		0 12538		0 14713
62		0 75029	10 6	0 14197		0		0 15713
63		0 75029		0		0	10 8	0 15713
64		0 62256		0 13197		0 12538		0 14713
65		0 75029		0 13197		0		0 14713
66		0 76029		0 13197		0		0 14713
67	9 4	0 76029		0 13197		0 12538		0 14713
68		0 62256		0 13197		0		0 14713
69		0 75029		0 13197		0 01		0 14713
70		0 75029		0	11 8	0 13538		0 14713

Table 5 (con t)
Simulation 10 (non bromide application)

Time (min)	14 cm Br conc (mg/l)	14 cm Q1 (l/min)	26 cm Br conc (mg/l)	26 cm Q2 (l/min)	44 cm Br conc (mg/l)	44 cm Q3 (l/min)	67 cm Br conc (mg/l)	67 cm Q4 (l/min)
71		0 75029		0 13197		0		0 29945
72		0 75029		0		0		0 14713
73		0 75029		0 13197		0 12538		0 14713
74		0 75029		0 13197		0		0 14713
75		0 75029		0 13197		0		0 14713
76		0 87802		0 13197		0 12538		0 14713
77		0 75029		0		0		0 14713
78		0 75029		0 13197		0 12538		0 29945
79		0 87802		0 13197		0		0 14713
80		0 75029		0 13197		0		0 14713
81		0 87802		0 13197		0 12538		0 14713
82		0 75029		0 26993		0		0 14713
83		0 87802		0 13197		0		0 29945
84		0 75029		0 14197		0 12538		0 14713
85		0 87802	7 8	0 14197		0		0 15713
86		0 87802		0 26993		0	8 9	0 15713
87		0 75029		0 13197		0 12538		0 14713
88		0 87802		0 13197		0		0 29945
89		0 87802		0 13197		0 12538		0 14713
90		0 87802		0 13197		0		0 14713
91		0 87802		0 26993		0 12538		0 14713
92		0 87802		0 13197		0		0 14713
93		0 87802		0 13197		0 12538		0 29945
94		0 87802		0 13197		0		0 14713
95		0 87802		0 26993		0 12538		0 14713
96		0 87802		0 13197		0		0 29945
97		0 75029		0 13197		0 12538		0 14713
98		1 00575		0 13197		0 01		0 14713
99		0 88802		0 13197	9 6	0 13538		0 14713
100	6 7	0 88802		0 26993		0		0 29945
101		0 87802		0 13197		0 12538		0 14713
102		0 87802		0 13197		0		0 14713
103		0 87802		0 13197		0 12538		0 14713
104		0 87802		0 13197		0		0 29945
105		0 87802		0 13197		0 12538		0 14713
106		0 87802		0 26993		0		0 14713
107		0 87802		0 13197		0 12538		0 29945
108		0 75029		0 13197		0 12538		0 14713
109		0 87802		0 13197		0		0 14713
110		0 87802		0 13197		0 12538		0 29945
111		0 87802		0 26993		0 12538		0 14713
112		0 87802		0 13197		0		0 14713
113		0 75029		0 13197		0 12538		0 29945
114		0 87802		0 13197		0		0 14713
115		0 87802		0 27993		0 12538		0 14713
116		0 87802	5 6	0 14197		0 12538		0 30945
117		0 87802		0 13197		0	7 6	0 15713
118		0 87802		0 13197		0 12538		0 14713
119		0 87802		0 26993		0 12538		0 29945
120		0 87802		0 13197		0		0 14713
121		1 00575		0 13197		0 12538		0 14713
122		0 75029		0 26993		0 12538		0 29945
123		0 87802		0 13197		0		0 14713
124		0 87802		0 13197		0 12538		0 14713
125		0 87802		0 13197		0 12538		0 29945
126		0 87802		0 26993		0		0 14713
127		0 87802		0 13197		0 12538		0 14713
128		0 87802		0 13197		0 12538		0 29945
129		0 87802		0 13197		0		0 14713
130		0 87802		0 26993		0 12538		0 29945
131		0 87802		0 13197		0 12538		0 14713
132		0 87802		0 13197		0		0 14713
133		0 87802		0 26993		0 12538		0 29945
134		1 00575		0 13197		0 12538		0 14713
135		0 87802		0 13197		0		0 29945
136		0 87802		0 26993		0 12538		0 14713
137		0 87802		0 13197		0 12538		0 14713
138		0 88802		0 13197		0 01		0 29945
139	5 1	0 88802		0 26993	7 8	0 13538		0 14713

Table 5 (con t)
Simulation 10 (non bromide application)

Time (min)	14 cm Br conc (mg/l)	14 cm Q1 (l/min)	26 cm Br conc (mg/l)	26 cm Q2 (l/min)	44 cm Br conc (mg/l)	44 cm Q3 (l/min)	67 cm Br conc (mg/l)	67 cm Q4 (l/min)
140		1 00575		0 13197		0 12538		0 14713
141		0 87802		0 13197		0		0 29945
142		0 87802		0 26993		0 12538		0 14713
143		0 87802		0 13197		0		0 14713
144		0 87802		0 13197		0 12538		0 29945
145		0 87802		0 13197		0 12538		0 14713
146		0 87802		0 26993		0		0 29945
147		0 87802		0 13197		0 12538		0 14713
148		0 87802		0 13197		0 12538		0 14713
149		1 00575		0 13197		0		0 29945
150		0 87802		0 26993		0 12538		0 14713
151		0 87802		0 13197		0 12538		0 29945
152		0 87802		0 13197		0		0 14713
153		0 87802		0 26993		0 12538		0 14713
154		0 87802		0 13197		0 12538		0 29945
155		0 87802		0 13197		0		0 14713
156		0 87802		0 26993		0 12538		0 29945
157		1 00575		0 13197		0 12538		0 14713
158		0 87802		0 14197		0 13538		0 29945
159		0 87802	4 2	0 27993	7 3	0 01		0 15713
160		0 87802		0 13197		0 12538	5 8	0 15713
161		0 87802		0 13197		0		0 29945
162		1 00575		0 26993		0 12538		0 14713
163		0 87802		0 13197		0 12538		0 14713
164		0 87802		0 13197		0		0 29945
165		0 87802		0 13197		0 12538		0 14713
166		0 87802		0 26993		0 12538		0 29945
167		1 00575		0 13197		0 12538		0 14713
168		0 87802		0 13197		0		0 29945
169		0 87802		0 26993		0 12538		0 14713
170		0 87802		0 13197		0 12538		0 14713
171		0 87802		0 13197		0		0 29945
172		0 75029		0 13197		0 12538		0 14713
173		1 01575		0 27993		0 13538		0 15713
174	4 3	0 88802	3 8	0 14197	7 1	0 01	5 4	0 30945
175		0 87802		0 13197		0 12538		0 14713
176		0 87802		0 26993		0 12538		0 14713
177		0 87802		0 13197		0		0 29945
178		1 00575		0 13197		0 12538		0 14713
179		0 87802		0 26993		0 12538		0 29945
180		1 00575		0 26993		0 12538		0 14713
181		1 00575		0 13197		0		0 29945
182		1 00575		0 26993		0 12538		0 14713
183		1 13347		0 26993		0 12538		0 29945
184		1 00575		0 26993		0 12538		0 29945
185		1 13347		0 4079		0 12538		0 14713
186		1 13347		0 26993		0 12538		0 29945
188		1 01575		0 27993		0 13538		0 14713
189	4 9	1 01575	4 5	0 27993	8 1	0 13538		0 30945
190		1 00575		0 13197		0 12538	5 5	0 30945
191		1 00575		0 27993		0 01		0 14713
192		0 87802	5 1	0 01	7 5	0 13538		0 29945
193		0 76029		0 13197		0 12538		0 15713
194	5 5	0 63256		0 14197		0 13538	5 5	0 30945
195		0 62256	5 3	0 01	7 8	0 01		0 14713
196		0 49483		0		0 12538		0 29945
197		0 49483		0 13197		0 12538		0 14713
198		0 3671		0		0		0 30945
199		0 3671		0 01		0 12538	5 9	0 15713
200		0 3671	5 6	0 01		0		0 14713
201		0 3671		0		0 12538		0 14713
202		0 23937		0		0		0 29945
203		0 3671		0		0 12538		0 14713
204		0 23937		0		0		0 14713
205		0 24937		0		0		0 14713
206	6 4	0 12164		0 01		0 13538		0 14713
207		0 23937	6 2	0 01	7 8	0 01		0 14713
208		0 11164		0		0		0 14713
209		0 23937				0		0 14713

Table 5 (con t)
Simulation 10 (non bromide applicat on)

Time (min)	14 cm Br conc (mg/l)	14 cm Q1 (l/min)	26 cm Br conc (mg/l)	26 cm Q2 (l/min)	44 cm Br conc (mg/l)	44 cm Q3 (l/min)	67 cm Br conc (mg/l)	67 cm Q4 (l/min)
210		0 11164				0 12538		0 14713
211		0 11164				0		0 14713
212		0 11164				0		0 14713
213		0 11164				0		0 15713
214		0 11164				0 12538	7	0 15713
215		0 11164				0		0 14713
216		0				0		0 14713
217		0 11164				0		0
218		0 12164				0		0 14713
219	7 2	0 01				0 01		0 14713
220		0 11164			8	0 13538		0 14713
221		0				0		0 14713
222		0 11164				0		0 14713
223		0				0		0 01
224		0				0 01	7 3	0 15713
225		0 11164			7 6	0 01		0 14713
226		0				0		0 14713
227		0				0 12538		0
228		0 11164				0		0 14713
229		0				0		0 14713
230		0				0		0 14713
231		0				0		0
232		0 11164				0		0 14713
233		0				0		0 14713
234		0 01				0		0
235	8	0 01				0		0 15713
236		0				0 01	7 6	0 15713
237		0			8 5	0 13538		0
238		0				0		0 14713
239		0 11164						0
240		0 01						0 14713
241	8 3	0 01						0 14713
242		0						0 01
243							7 8	0 15713
244								0
245								0 14713
246								0 14713

VITA

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